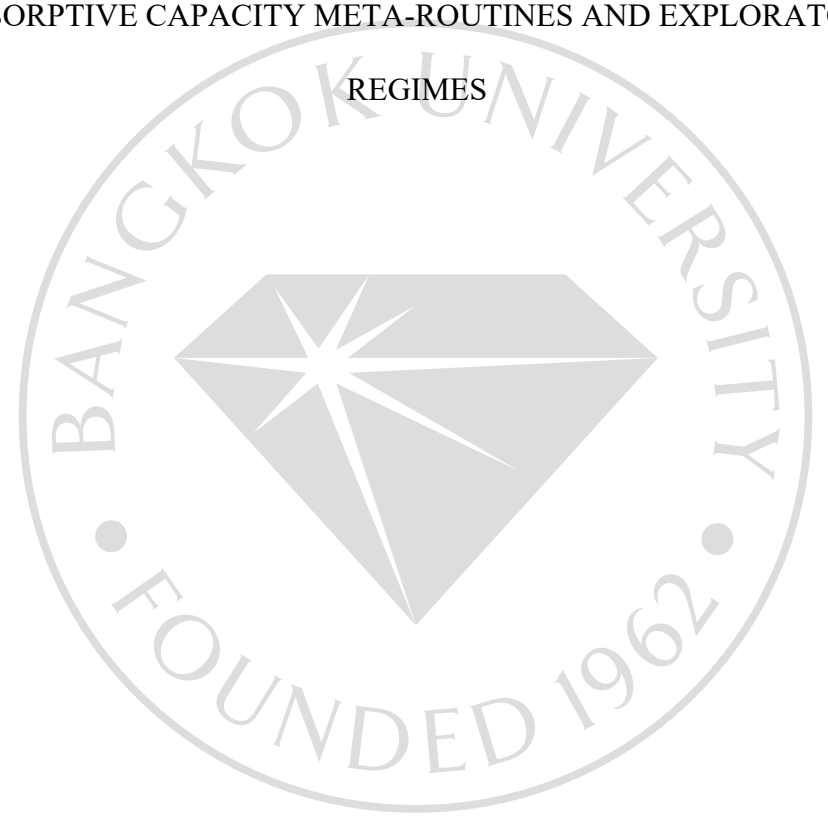
EXTERNAL KNOWLEDGE ABSORPTION IN INFORMATION TECHNOLOGY SMALL AND MEDIUM ENTERPRISES: EXPLORATORY MULTIPLE CASE STUDIES OF THE ROLE OF ABSORPTIVE CAPACITY META-ROUTINES AND EXPLORATORY REGIMES



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By

Chulatep Senivongse

2019

DECLARATION

In accordance with the Bangkok University Honor Code, I certify that my submitted work here is my own work, and that I have appropriately acknowledged all external sources that were used in this work.

Date: November 2017

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Signature

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External Knowledge Absorption in Information Technology Small and Medium Enterprises: Exploratory Multiple Case Studies of the Role of Absorptive Capacity Meta-Routines and Exploratory Regimes (413 pp.)

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ABSTRACT

Small and Medium Enterprises (SMEs) are known to be the foundation of the business economy in every country. Information Technology (IT) SMEs in Thailand are trading companies mostly. They do not invest so much in R&D to differentiate their products from competitors, and most of them resell the products that are researched and manufactured by foreign companies. However, without investments in R&D, the competition in the market becomes strong. Some of them gain strength throughout the years, while some of them struggle year by year but still manage to survive. The survival seems to rely on the firm's ability to adjust and gain special leverage through the caption of knowledge from within the IT industry.

IT SMEs thus seems to be the perfect venue to conduct a study on absorptive capacity. The IT industry is known to be a fast-moving industry with new technology out into the market all the time, along with new standards, regulations that accommodate the IT governance, and new demands from customers. There is new knowledge to be developed for new product release. This raised a question on how

these IT SMEs realized, decided, absorb, and develop knowledge from external environment to leverage their competitive capability.

Drawing on data collected from IT SMEs in Thailand, this research study thus explores how new knowledge is absorbed and how absorptive capacity meta-routines and exploratory regimes contribute to this absorption process. A qualitative methodology was employed, and six IT SMEs were analyzed. Findings revealed that absorptive capacity was crucial to these SMEs, and that meta-routines and exploratory regimes were key to knowledge absorption. In particular, the contribution of exploratory regimes agent roles, behavioral factors, and impact factors all appeared to have an influence on knowledge absorption with some culturally sensitive factors that emerged as unique to the Thai environment. Financial performance indicators showed that the effort in developing absorptive capacity was positively related to the firm's asset turnover, account receivable turnover, and gross profit margin for IT SMEs. Some refinements to the original work on meta-routines are proposed, which include modifications to the sequence of meta-routines, the knowledge transfer boundaries, and the feedback loop. Contributions to theory and practices are discussed, and suggestions for future research are offered.

Keywords: Absorptive Capacity, Absorptive Capacity Meta-routines, Exploratory Regimes, Thailand, IT SMEs, Dynamic Capabilities

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CHAPTER 1

INTRODUCTION

Small and Medium Enterprises (SMEs) are known to be the foundation of business economies in several developing countries (OECD, 2013). According to the report generated by Thailand's Office of Small and Medium Enterprise Promotion (2012), SMEs were found to generate a national 2011 GDP of 3,859,5876 Million Baht. This accounted for 36.6% of the nation's GDP in that specific year. Small Enterprises (SEs) were known to contribute 24.5% of the total country's GDP, while Medium Enterprises (MEs) totaled 12.1%.

In terms of size and economic employment, SMEs accounted for more than 99% of the number of overall enterprises in Thailand. They accounted for more than 77% of the overall employment in 2007 (Office of Small and Medium Enterprise Promotion, 2012b), increasing to 83.89% in 2011. Information Technology (IT) SMEs are classified under Wholesales and Retail Trade (see the complete categorization in Table 1.1). The number of SMEs in this category accounts for 55.6% of the overall number of SMEs.

IT SMEs in Thailand are mostly trading companies. They do not invest in R&D, rather resell the products that are researched and manufactured by foreign companies. Each year, hundreds of IT SMEs come and go in the IT industry in Thailand. Without a research and development capability within SMEs, the competition in the market becomes strong.

Characteristics of this market are: (1) it is fast growing and dynamics, and rule and regulations are subject to frequent changes; (2) training and internal development programs are often costly for those SMEs; (3) turnover is high and knowledge loss has consequently huge impact on internal organizational dynamics (Mariano et al., 2015); (4) language barriers may constitute a substantial issue when foreign managers have to deal with local specificities; (5) customers demand is high, and SMEs are forced to learn fast to accommodate these requests.

Although these huge limitations clearly challenge IT SMEs, however, there are evidences of enterprises that manage to survive, and even flourish. A few of these enterprises gain strength throughout the years, while some of them struggle year by year but still manage to survive. Their survival seems to rely on the firm's ability to adjust and gain special advantage through their capacity to capture new knowledge from the external IT industry.

The context of IT SMEs in Thailand seems, thus, to be the perfect research setting to conduct a study on absorptive capacity. It is argued that absorptive capacity is likely to help these firms survive in this environment. This is the overall object of this research study that aims to investigate how SMEs absorb new knowledge and what related factors influence the absorption of this knowledge.

1.1 Problem Statement

Over the past twenty-five years and since the construct has been introduced by Cohen and Levinthal in 1990, absorptive capacity has been extensively studied. The primary assumption is that absorptive capacity drives a firm's competitive advantage through the development of R&D. However, later research proves that absorptive capacity is not just valid for R&D activities, but also plays an important role in non-

R&D-supporting firms (Daspit & Souza, 2013). Many researchers have focused on the antecedents or moderating factors that contribute to enrich the construct (Enkel & Heil, 2014; Fosfuri & Tribó, 2008; Jansen, van den Bosch, & Volberda, 2005; Joglar & Chaparro, 2007). However, there are a very limited number of studies that empirically support and explain the internal capabilities of absorptive capacity, with particular reference to the internal routines and meta-routines that facilitate knowledge acquisition and exploitation (Lewin, Massini, & Peeters, 2011; Peeters, Massini, & Lewin, 2014; Salvato & Rerup, 2011). The study of absorptive capacity from a meta-routine perspective (Lewin et al., 2011) may represent a valid alternative to previous approaches where absorptive capacity–although conceived as a potential mediating or moderating variable–still largely remains a black box. As stated by Lewin et al. (2011): "The empirical studies using the absorptive capacity construct treat absorptive capacity as a black box or as an exogenous variable" (p. 83). Understanding and operationalizing absorptive capacity internal and external routines and mechanisms and providing empirical evidence of its enabling and hindering factors has thus value, and represents a fruitful area for research explorations (Joglekar, Bohl, & Hamburg, 1997; Zahra & George, 2002).

1.2 Purpose of Study

The purpose of this study is to investigate how SMEs absorb new knowledge from a meta-routine perspective (Lewin et al., 2011), with particular reference to organizational processes, procedures, routines, and exploratory regimes. These mechanisms autonomously occur in the IT SMEs whenever new technological drivers are launched, and thus facilitate their investigation in this specific industry.

1.3 Research Questions

The key question of this research study relates to how IT SMEs in Thailand absorb new knowledge. With limited resources and a deficiency in learning opportunities when compared to larger enterprises, it is intriguing to consider how these organizations identify and absorb relevant knowledge, which may contribute to their survival. This raises the primary research question, as follows:

RQ: How do IT SMEs absorb new knowledge?

Absorbing new knowledge requires certain processes and routines in assimilating, transforming and exploiting knowledge (Cohen & Levinthal, 1990; Todorova & Durisin, 2007; Zahra & George, 2002). Previous researchers show a very limited number of studies on how organizations handle this transformation (Lewin et al., 2011). The routine level will provide more granular descriptions, and, therefore, it is worth exploring. This raises the following first sub-research question:

RQ-a: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?

Additionally, and since knowledge absorption may or may not be successfully achieved, a second sub-question is formulated as follows:

RQ-b: What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?

1.4 Significance of Study

The study of absorptive capacity from a meta-routine perspective is significant for both theory and practice.

From a theoretical perspective, this study explores the mechanisms contributing to absorptive capacity and sheds some light on the processes and routines that contribute

to knowledge absorption within organizations. This is a clear under-searched area of exploration. Recent review (Senivongse, Mariano, & Bennet, 2014), more conceptual contributions (Lewin et al., 2011), and empirical explorations (Mariano & Al-Arrayed, 2016) have highlighted the benefits of investigating absorptive capacity from this specific perspective.

From a practitioner perspective, this study helps managers identify the intrinsic internal capabilities related to absorptive capacity, which at today, largely remain a black box for managerial practice. This, in turn, contributes to increased knowledge acquisition and exploitation processes and, ultimately, to increased speed-to-market (Murray & Chao, 2005), innovation (Robertson, Casali, & Jacobson, 2012), and organizational success (Boutros & Purdie, 2014).

From a personal perspective, I am always intrigued by how these IT SMEs, which only sell common IT products and services, survive in fierce competitive market. I believe that absorptive capacity is the key enabler for such sustainability. Using meta-routines for absorptive capacity as the exploratory guidelines, this study helps unfold my doubt on how these firms prepare themselves to cope with the dynamic changing of competitive capability with the new absorbed and transformed knowledge. This study explores into details each absorptive capacity's internal capabilities. The findings will point out mechanisms and components required to sustain competitive advantage and survival in the market.

1.5 Conceptual Framework

The framework employed in this study is developed from the systematic literature review conducted on absorptive capacity, with specific reference to the meta-routine perspective. The framework combines the internal absorptive capacity capabilities

i.e., identification, acquisition, assimilation, transformation and exploitation, with the factors identified and grouped into what I label as exploratory regimes. These exploratory regimes indicate the focus areas to explore in the multiple case studies research contexts. Figure 1.1 illustrates the framework used in conducting this research study. This framework is discussed in-depth in Chapter 2.

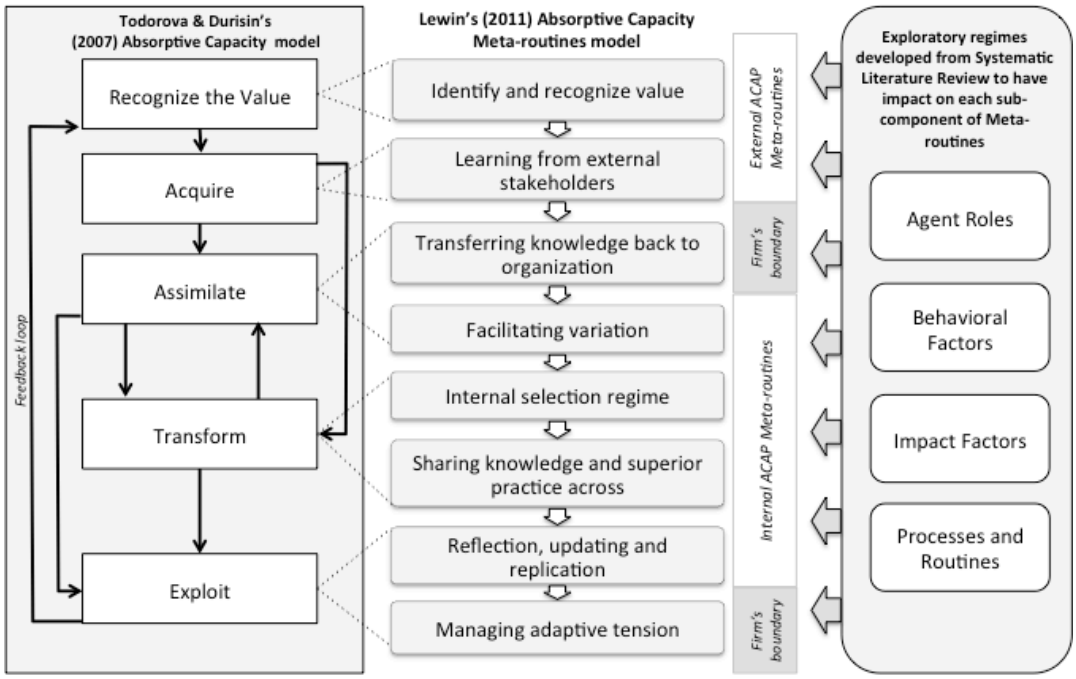


Figure 1.1: Conceptual framework to study absorptive capacity meta-routines and internal capabilities

1.6 Research Methodology

This research study makes a constructionist epistemological assumption, seeing reality as a construction derived from interpretation in relation to the existence of a phenomenon. I will follow the recommendations of Alvesson and Skoldberg (2013) and engage in an abductive approach involving high levels of reflexivity. The abductive approach allows the combinative use of theory-based research to guide the

study, and uses the data-driven approach to derive new theoretical findings to enrich existing theory (Alvesson & Skoldberg, 2012).

My empirical explorations are guided by a conceptual framework developed from the literature review, derived from the collected evidence of actual phenomena, and interpreted by the experience of the researcher (Yin, 2014).

In order to collect data, multiple case studies are selected. This approach is due to the nature of the research questions intended to explore in detail how IT SMEs absorb new knowledge. Six cases are selected, and the level of analysis is the organizational level. Data are collected using individual semi-structured interviews, on-site observations, and public and private documents. These data collection methods ensure triangulation of data (Creswell, 2013) and increase the quality of my research findings.

1.7 Assumptions

It is assumed that IT SMEs are not supporting R&D activities to differentiate themselves and to leverage the degree of monopoly for customer selection. Rather, they are turning themselves into common IT product and service trading companies.

1.8 Scope of the Research Study

This research study includes six IT SMEs as the sampling choice. Participants are selected according to a purposeful sample selection strategy for individual interviews. Furthermore, this study is not focused on technology management and, therefore, related discussions remain out of the scope of this research study. Other limitations are related to the temporal and geographical aspects of data collection and analysis.

1.9 Key Term Definitions

In this section, I define the terms used throughout this dissertation.

SMEs: Small and Medium Enterprises. According to the Ministry of Industry of Thailand (2002), the classification of SMEs takes into account number of employees and paid up capital, as shown in Table 1.1.

Table 1.1: Classification of Thai SMEs

SME by Business Sector	**Number of employees**		**Paid up capital***	
	Small	**Medium**	**Small**	**Medium**
Retail sector	< 15	16 – 30	< 30 MTHB	31 – 60 MTHB
Wholesale sector	< 25	26 – 50	<50 MTHB	51 – 100 MTHB
Service sector	< 50	51 – 100	<50 MTHB	51 – 100 MTHB
Manufacturing sector	< 50	51 – 200	<50 MTHB	51 – 100 MTHB

*Note: 1 USD = 35 THB as of September 2015

Source: Ministry of Industry of Thailand (2002)

IT SMEs: IT Companies providing products and services in the IT industry. A small IT enterprise employs less than 50 employees with paid up capital in less than 50 MTHB.

Competitive advantage: A firm's advantage to compete with others in a high velocity and high dynamic market. With this advantage, a firm's products and services become the preferred choice for the customer (Pablos, 2006).

Degree of monopoly: When a firm has privileged preference from customers to become the selected choice, selling products or services that may not be different from others (Nelson & Winter, 2009).

Degree of centrality: The popularity of reputation (Tortoriello, 2006).

Absorptive capacity: The ability of firms to identify, acquire, assimilate, transform and exploit new external knowledge to create competitive advantage (Todorova & Durisin, 2007, p. 776).

Dynamic capabilities: The firm's ability to adjust to the environment or rapid technological change and sustain its competitive advantage (Teece, Pisano, & Shuen, 1997, p. 511).

Routines: "Complex and analytic processes that extensively rely on existing knowledge, linear execution, and repetition to produce predictable outcomes at different organizational levels" (Salvato & Rerup, 2011, p. 469).

Absorptive capacity meta-routines: "The higher-level routines that are associated with a bundle of specific operational lower-level routines or standard operating procedures that express these meta-routines" (Lewin et al., 2011, p. 84).

Exploratory regimes: A set of factors that has an impact on internal capabilities of absorptive capacity.

CHAPTER 2

REVIEW OF THE LITERATURE

The purpose of this chapter is to investigate how previous research addressed the topic of absorptive capacity and to identify the theoretical gaps in this research domain.

The chapter provides a chronological as well as an analytical review of the absorptive capacity domain with respect to the past 25 years of research.

2.1 Introduction to the Systematic Literature Review Method

A systematic literature review method is employed to identify articles to be reviewed. The systematic literature review method is sometimes referred to as an evidence-based review method. It is also described by Fiegen (2010) as a systematic approach that offers:

> A model for summarizing and critiquing the literature to improve future practice and possibly encourage higher levels of research methods. A systematic literature review of 30 years should reveal evidence toward a maturing research methodology (Fiegen, 2010, p. 386).

The systematic literature review approach has its roots in medical research and it is now becoming an alternate choice in other fields, including nursing, psychology, information systems, and business and management studies(Adolphus, 2015)(Adolphus, 2015)(Adolphus, 2015)(Adolphus, 2015)(Adolphus, 2015)(Adolphus, 2015)(Adolphus, 2015)(Adolphus, 2015) (Adolphus, 2015).

According to Khan et al. (2003), a literature review is considered a systematic literature review when the review:

> is based on a clearly formulated question, identifies relevant studies appraises their quality and summarizes the evidence by use of explicit methodology. It is the explicit and systematic approach that distinguishes systematic reviews from traditional reviews and commentaries (Khan et al., 2003, p. 118).

2.1.1 Traditional Literature Review and Systematic Literature Review

Traditional literature reviews can be labelled in many ways, including narrative reviews, critical reviews, or commentaries (Hemmingway & Bereton, 2009). Those authors who conduct a literature review are normally experts in the field, and use informal, unstructured, unsystematic approaches to collect and interpret information (Jackson, 2008). It often takes an author-centric approach (Webster & Watson, 2002).

Conversely, a systematic literature review takes a concept-centric approach (Webster & Watson, 2002). The concepts determine the organizing framework of a review. In traditional reviews, researchers may use both approaches—the concept-centric and author-centric—to conduct the review. However, the author-centric model may result in a failure to synthesize the literature. This makes the author-centric approach unfavorable for a systematic literature review. Table 2.1 clarifies the different approaches to literature reviews. Once the review has been done, the literature can be compiled into matrices. Examples are shown in Table 2.1, Table 2.2, and Table 2.3.

Table 2.1: Literature review approach

Approach to Literature Reviews	
Concept-centric	Author-centric
Concept X … [author A; author B, …] Concept Y … [author A; author C, …]	Author A … [Concept X, Concept Y, …] Author B … [Concept X, Concept Z, …]

Source: Adopted from Webster and Watson (2002, p. xvii)

Table 2.2: Concept matrix

Concept Matrix					
Articles	Concepts				
	A	B	C	D	…
1		x	x		x
2	x	x			
…			x	x	

Source: Adopted from Webster and Watson (2002, p. xvii)

Table 2.3: Cross-reference with unit of analysis

Concept Matrix in Cross-references With Units of Analysis															
	Concepts														
	A			B			C			D			…		
Article\Unit of Analysis*	I	G	O	I	G	O	I	G	O	I	G	O	I	G	O
1					x					x					x
2	x				x	x		x							
…								x		x			x		

*Unit of Analysis Legend: I (Individual), G (Group), O (Organizational)

Source: Adopted from Webster and Watson (2002, p. xvii)

According to Boell and Cecez-Kecmanovic (2015), a systematic literature review differs from the traditional literature review in the sense that in traditional literature reviews, the sequence of revision starts from a primary article or journal. The next article in the sequence to be reviewed comes from the cited reference from the primary article. The numbers of referred articles depend on the researcher's choice of whether an article is to be reviewed or not. Retrieved articles are stored in a reference space. There can be any number of articles in the reference space of a traditional

literature review. Researchers conduct the review by focusing on responses to the research questions, topic, or framework with selective criteria based on importance, accessibility, and persuasiveness (Boell & Cecez-Kecmanovic, 2015). This way makes the traditional literature review efficient, direct on track without wasting time on irrelevant articles. This also ensures time-saving. However, this approach makes the traditional literature review subject to bias. A selection of articles to review is based on the judgment of the researcher alone. Other factors impacting the quality of the review are the conclusiveness of article sources, validity and reliability of selection through the peer-review process (Hemmingway & Bereton, 2009). Table 2.4 compares the two reviewing methods.

Table 2.4: Traditional and systematic literature reviews comparison

Characteristics	**Types of Literature Review**	
	Traditional	**Systematic**
Definition	Describes and appraises previous work, but not the method to come about the reviewed studies, the selection, and the evaluation.	Precise scope of review, with a clear explanation of selection criteria with the objective to find and review all the studies that are relevant to the search definitions. Validity and integrity are inscribed into the search condition as a way to control the quality of the reviewed articles.
Uses	For an overview, discussion, commentary, identification of research gaps. Always used as supporting evidence for new research.	Identify, appraise, and synthesize all available research that is relevant to a particular review question. Can be used as a research method, having the reviewed articles as the source of data for research analysis. The application can be for qualitative, quantitative or mixed-methodology.
Limitations	Bias occurs from the unknown selection and assessment criteria. The process of review cannot be replicated.	Time-consuming due to the reviewing process that involves many irrelevant articles due to ambiguity in keyword definition and interpretation of research concept by the authors.

Source: Adopted from Jackson (2008)

According to Moher, Liberati, Tetzlaff, and Altman (2009), a systematic literature review sequence starts from a keyword or combination of keywords search, with applied search conditions that represents the focus area. Articles retrieved from such keywords search are kept under a constructed space. The numbers of article to be reviewed are the number of articles that are retrieved, depending on the search criteria and limitations.

The purpose of a systematic literature review is to overcome the drawback of the traditional literature review method by reducing the bias. It is to ensure that the reviewed documents are toward the objectivity of the focus area, providing transparency based on retrieval criteria. It is also to ensure the repeatability of the reviewed results if a review is conducted by other researchers based on the same conditions (Webster & Watson, 2002)

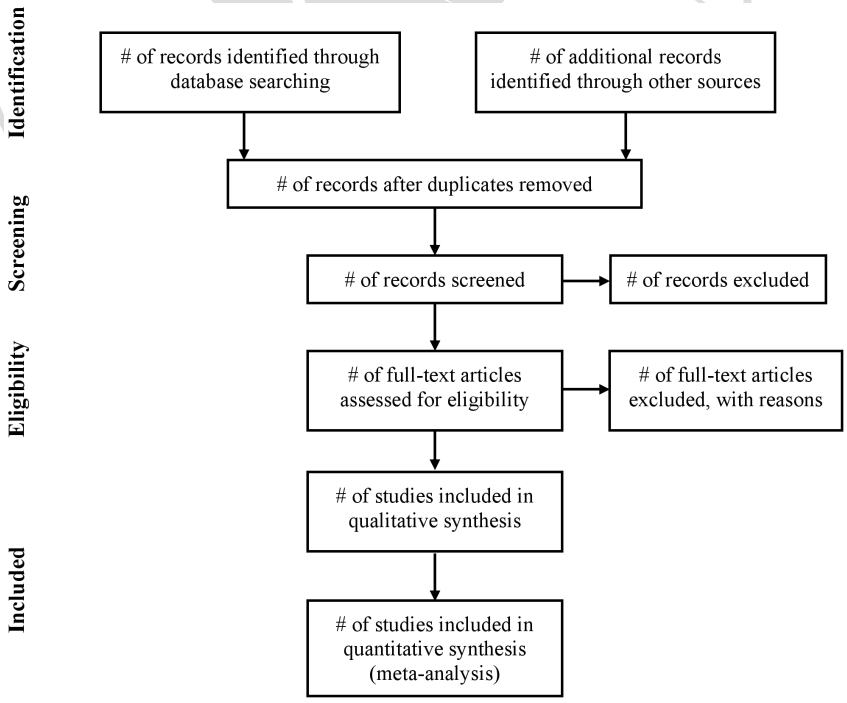


Figure 2.1: PRISMA Diagram on search and screening of articles to review

Source: Moher, Liberati, Tetzlaff, and Altman (2009)

The PRISMA diagram (Moher et al., 2009) in Figure 2.1 explains the searching and screening process of articles selection when conducting a systematic literature review. The purpose of the diagram is to provide the researcher step guidelines to follow and to ensure the recording of what is to be kept and what is to be eliminated based on what conditions. For comparison, Figure 2.2 is a representation of a traditional literature review and a systematic literature review.

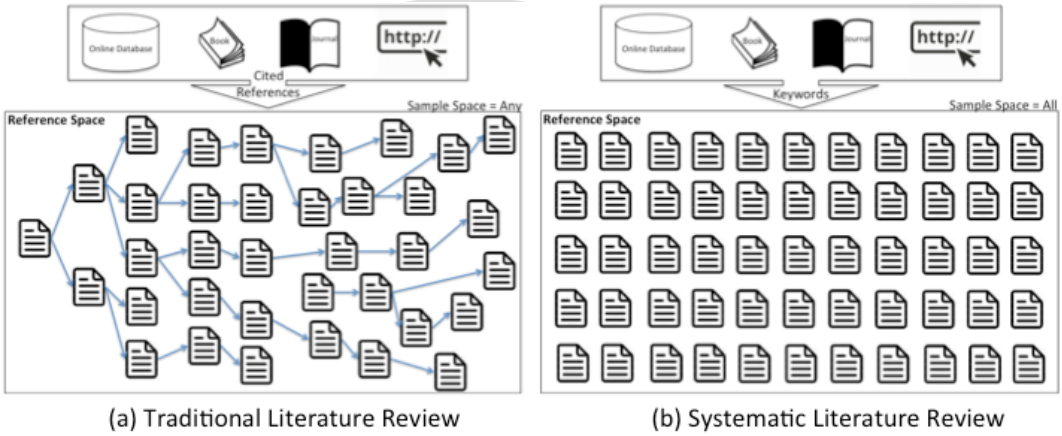


Figure 2.2: Representation of (a) Traditional Literature Review and (b) Systematic Literature Review

In a systematic literature review, the researcher always forms the research question before the commencing of the review (Boell & Cecez-Kecmanovic, 2015). This provides a solid pathway to direct what the researcher is looking for, allowing the formulation of a meaningful scoping of the literature. With predefined research questions, the researcher can look for evidence from the literature. This is considered a more direct approach to developing a good support-based literature review (Khan et al., 2003).

2.1.2 The Downside of a Systematic Literature Review

The use of a systematic literature review to eliminate bias can arguably lead to debates. Bias from a systematic literature review may result from the criteria conditions set forth for resource screening. Bias may come from the selection of journals to review (Khan et al., 2003). The top journal in each field of study contains the quality, high validity, and trustworthiness from the body of scholars who review the articles (Fiegen, 2010). However, since these top journals have long lines of articles waiting to be published, many authors turn to field-specific journals with lower acceptance conditions and shorter waiting lines (Shafique, 2013). Sometimes, many good articles come from these journals.

Screening of the article publishing date can also lead to bias (Khan et al., 2003). Defining the period of published articles for retrieval results means to omit some articles that are not in the range of selection. This range does not guarantee that the discrete articles are relevant to the referential context (Khan et al., 2003).

One fundamental element of a systematic literature review is the reliance on good database search and retrieval. Good search keywords and terms defined upfront can be problematic (Boell & Cecez-Kecmanovic, 2015) because it is difficult to know the "right" keywords beforehand. Another deficiency is the use of alternate terminology and the lack of precision of the search term (Boell & Cecez-Kecmanovic, 2015). Some authors use a certain definition and name to define a concept, while others may use a different term to define the same thing, resulting in the exclusion of some articles.

For the novice researcher, the inefficiency of a systematic literature review approach is the amount of time spent on reviewing the resources over the whole

reference space (Boell & Cecez-Kecmanovic, 2015). A researcher can spend a tremendous amount of time going through irrelevant articles due to the ambiguity of reference keywords or the inconsistent interpretation about the meaning of concepts by the other authors.

Alarmingly, the use of a systematic literature review by a novice researcher can bring about poor critical thinking conditions (Hemmingway & Bereton, 2009). Using this type of review without a clear understanding and awareness of its limitations can result in vagueness of the entire study—delimiting the topic with discriminating terms. The results become very specific by trying to provide evidence that supports the answer to the research question (Boell & Cecez-Kecmanovic, 2015).

2.1.3 The Upside of a Systematic Literature Review

A systematic literature review is the most suitable approach when there is a substantial amount of past research on a given area of interest, substantial relevant research over a long period, or several disparate findings causing uncertainty in the predicted outcome (Hemmingway & Bereton, 2009). A systematic literature review can be used as a research method (Fiegen, 2010). It can be used for data and information collection (Fiegen, 2010; Jackson, 2008) to perform quantitative, qualitative, or mixed methods for research methodology and analysis (Boell & Cecez-Kecmanovic, 2015; Fiegen, 2010; Jackson, 2008). A systematic literature review enhances the exploration of new ideas, the finding of new alternatives, and the developing of new hypotheses and research proposals (Fiegen, 2010). Further, systematic literature reviews produce metadata about the research topic (Boell & Cecez-Kecmanovic, 2015). This metadata is the fundamental element for cross-research reference statistical methods or data analytics (Webster & Watson, 2002), so-

called meta-analysis (Fiegen, 2010; Khan et al., 2003). This allows the possibility of applying some analytical tools such as textual analysis, data mining techniques, or meta-analysis tools. Applying the combination of statistical methods and analytics to produce results from the pool of research references makes this group of actions no longer just a review, but a complete research study on its own.

Boell and Cecez-Kecmanovic (2015) state that a good literature review has the following characteristics: First, it must be comprehensive and provide a depth and breadth of understanding. It should give the readers all aspects regarding the topics. Second, it must develop an argument. A good review should provide readers with the study gap and a recommendation for future research. Third, it must engage in the research development from beginning to end. A good literature review must support the research development in all stages. Fourth, it must possess criticality. A high-quality literature review is to provide criticality of assessment of existing knowledge about the target phenomenon. Fifth and last, a good review provides originality and innovative views. The review should give new insights, perspectives and understanding about the history of research works.

2.1.4 Conducting a Systematic Literature Review

Khan et al. (2003) provide a good stepwise framework for conducting a systematic literature review. According to their framework, “a systematic literature review should follow five steps: Step 1: Framing the questions for a review; Step 2: Identifying relevant work; Step 3: Assessing the quality of studies; Step 4: Summarizing the evidence; and Step 5: Interpreting the findings” (p. 118).

The details of these steps are summarized in Table 2.5 with the description of expected outcomes from each step.

Table 2.5: Steps in systematic literature reviews

Step	Step Label	Definition	Outcomes
1	Framing the questions for a review	Problem to be addressed is specified with clear, unambiguous, and structured questions.	Identification of relevant research theories, construct, or concepts as the areas to focus
2	Identifying relevant work	Use of keywords to identify relevant articles and resources, including online academic databases, manual search, and books or other relevant resource types.	Identified strategy for searching, screening and organizing. This includes keywords, thesaurus, and synonyms. Identification of the search criteria, e.g., archival database, period of search, quality of article, and list of approved journals.
3	Assessing the quality of studies	Multiple steps involve: (1) identify search criteria, (2) be able to describe the minimum level of acceptance, (3) ensure quality search results, (4) use same details on all sources of resources, (5) always make a recommendation for future research	Retrieved and downloaded articles. These articles must also be checked for duplication and elimination.
4	Summarizing the evidence	Data synthesis consists of tabulation of study characteristics, quality, and effects as well as the use of statistical methods for exploring and combining of heterogeneous resources.	Literature database with a summary of key contexts of each article, metadata attributes. Decisions and comments regarding the context of each article must also be recorded.
5	Interpreting the findings	Perform a meta-analysis to determine if overall summary could be trusted with high-quality results.	Cross article analysis based on pattern and evidence found.

Source: Adopted from Khan et al. (2003)

Both traditional and systematic literature reviews have advantages, disadvantages, and bias. Therefore, to minimize the disadvantages and bias and increase the advantages of both approaches, when conducting a literature review, the combination of both the traditional and systematic review approaches would ensure improved results. In fact, the traditional approach is best to integrate the supporting literature, while the systematic approach is excellent to perform an analysis for patterns or

research trends (Webster & Watson, 2002). In this research study, and for the reasons mentioned in the previous sections, I will combine and perform systematic and traditional literature reviews to select and analyze current research on absorptive capacity. Detailed descriptions of my methodological steps are discussed in the following sections.

2.2 A Combined Approach to the Literature Review

In this research study, I combine systematic and traditional literature review methods to review the absorptive capacity domain. This is to enhance the review coverage and comprehensiveness. The purpose of this literature review is to define the relevant background studies on absorptive capacity and the mechanisms of new knowledge absorption and use. A systematic literature review provides a suitable method of identifying the developments of the literature in the field. Additionally, it helps to summarize past developments, theoretical gaps, and future research directions. To accomplish these goals, I follow Khan et al.'s (2003) five steps in framing the review topics and strategy, identifying keywords and search conditions, retrieving articles and eliminating duplicates, analyzing the literature, and interpreting the findings. I integrate these identified studies with frequently cited studies that were not included in my systematic list, following a more traditional approach. Details of these steps are discussed in the next sections.

2.2.1 Framing the review

I conducted a systematic literature review of 189 papers in the past 25 years, retrieving primarily from the EBSCO database. I mainly focused on absorptive capacity internal capabilities concerning the processes of acquisition, assimilation,

transformation and exploitation. I integrated this list with additional articles retrieved according to a more traditional approach. The analytic results of my literature review produce a conceptual framework that will guide the empirical investigation of my study.

2.2.2 Identifying relevant works

All retrieved articles are from EBSCO Academic Search Database Service. EBSCO provides research contents with powerful search capabilities and has been widely accepted in academic institutions (EBSCO, 2015). EBSCO maintains metadata from both internal databases and the external sources to provide a vast array of access to archived search results. EBSCO Search provides the archived articles that are kept inside its internal database, as well as the linkage to external databases, including Emerald Insight and Science Direct.

2.2.3 Assessing the quality of studies

Multiple pre-defined keywords (under the context of Knowledge Management) are used as the search terms for articles. These terms include absorptive capacity, knowledge assimilation, knowledge transformation, knowledge exploitation, combinative capabilities, and absorptive capacity meta-routines. Table 2.6 provides the explanation for the keyword selection. The reason I do not use knowledge acquisition is that the knowledge acquisition appears as an antecedent factor to absorptive capacity in a large number of research studies (Fosfuri & Tribó, 2008; Jansen et al., 2005; Joglar & Chaparro, 2007; Madhok & Liu, 2006; Murray & Chao, 2005; Mursitama, 2011; Vega-jurado, Gutiérrez-Gracia, & Fernández-de-Lucio, 2008;

Y.-L. Wang, Wang, & Horng, 2009). Therefore, searching for absorptive capacity will already cover searching for knowledge acquisition.

Table 2.6: Selected search keywords with decision explanation

Search term	Explanation
absorptive capacity	The construct itself. Search will involve all studies regarding absorptive capacity.
knowledge assimilation	The internal capabilities of the absorptive capacity construct. The result will address the detailed studies based on this specific capability.
knowledge transformation	The internal capabilities of the absorptive capacity construct. The result will address the detailed studies based on this specific capability.
knowledge exploitation	The internal capabilities of the absorptive capacity construct. The result will address the detailed studies based on this specific capability.
knowledge exploration	The routine that is used when the acquired new knowledge is to be developed and added to the firm as a new resource (Lichtenthaler & Lichtenthaler, 2009; Liu, 2006).
combinative capabilities	The routine to combine new knowledge throughout the process of learning (Kogut & Zander, 1992).
absorptive capacity meta-routines	Granular level details of internal capabilities (Lewin et al., 2011; Peeters et al., 2014; Salvato & Rerup, 2011).

The conditions for search screening are as follows: (1) all articles must be written in English; (2) all articles are available in full-text format; (3) all articles must be peer-reviewed; and (4) all articles were written between January 1990 and December 2014. The selected time span covers the period between the publication of the seminal works (Cohen & Levintal, 1989, 1990) on absorptive capacity and the most recent developments. This is to avoid selection bias and to ensure that all research relating to the reviewed construct has been included. The review structure follows the PRISM diagram (Moher et al., 2009) in defining the searching and screening of the relevant articles as shown in Figure 2.3.

Upon performing the search according to the criteria, 189 articles were retrieved. All retrieved articles were saved using the standard naming convention. Standard naming helps eliminate the duplicated articles. These articles were then combined

with 13 manually downloaded articles that were heavily cited and had high relevance in the field. The combined number of articles at this point was 202. Out of these, there were 13 papers that appeared in more than one search term. They were eliminated for duplication. After elimination, a list of 189 articles in the reference space was reviewed. Books and book chapters were not included in the analysis since relevant monographs on absorptive capacity were not published within the considered time span of this literature review, and because the debate has exponentially grown and matured within academic journals, for the most part.

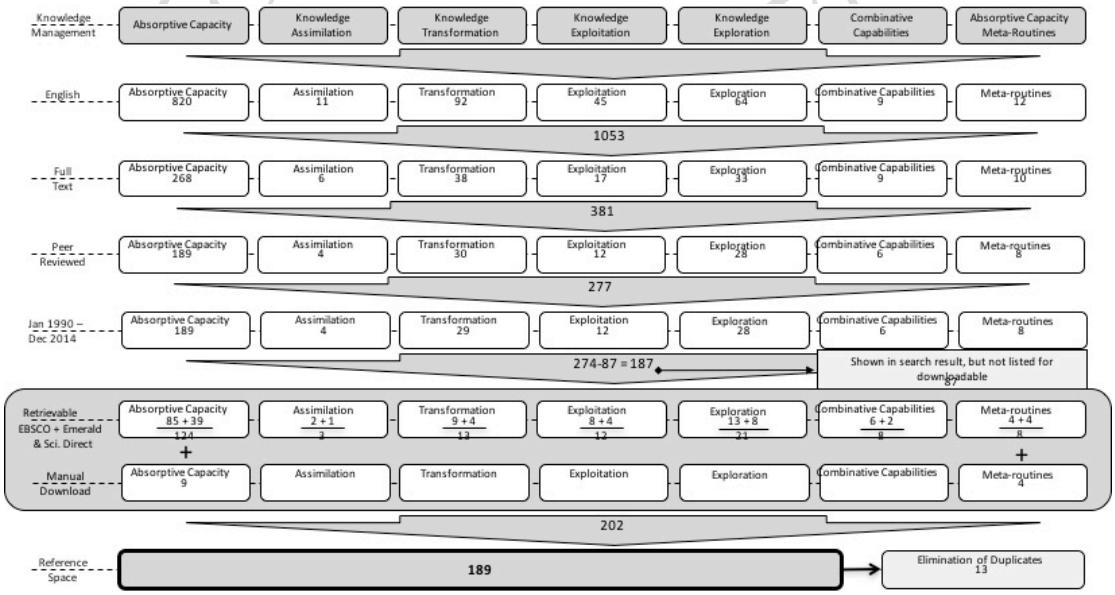


Figure 2.3: Adopted from PRISM diagram for selecting and screening of articles to review

2.2.4 Summarizing the evidence

To summarize the evidence, a spreadsheet is designed and used as a database. Records are organized and kept as shown in Table 2.7.

Table 2.7: Systematic Literature Review Master Database Scheme

	Constructed Database	**Definition**
Info.	Article #	Indexing of article for sorting purpose
	Authors	Names of authors
	Title	Title of the article, in Naming Conventional File Name
	Journal	Name of the journal
Metadata attributes	Keyword	Keyword that use as the search term
	Relevancy	Is this article related to absorptive capacity Internal routines?
	Year	Year of Publication
	Relevant Concept	Involving theoretical concepts
	Methodology	Methodology used for analysis
	Data Collection	Data collection method including populations
Textual Analytic Attributes	Industry	Research focused industry
	Use of Reference (Conceptualization)*	How the absorptive capacity construct is referenced in the study
	Based absorptive capacity referential model*	Identify the source of the absorptive capacity construct that is used for base of study
	Level of Analysis*	The level of analysis the research study is exploring
	Operationalization of absorptive capacity*	How the researcher sees the property of absorptive capacity
	Type of knowledge	The type of knowledge the research is dealing with
	Knowledge Definition	Definition of the knowledge involved in the study
	Identification (Acquisition) Discussion	How author discusses knowledge acquisition
	Assimilation discussion	How author discusses knowledge assimilation
	Transformation discussion	How author discuss the knowledge transformation
	Exploitation discussion	How author discusses knowledge exploitation
	Exploration discussion	How author discusses knowledge exploration
	Combinative Capabilities	How author discusses knowledge combination capabilities
	Firm's performance	How author discusses the impact of absorptive capacity on the firm's performance
	Summary	Summary of what the article discusses
	Finding/Result	The findings and results; the contribution of the article
	Implication & Discussion	Implications for theory and practice
	Future Research	Recommendations for future work
	Terminology	Definition of Glossary of terms in the article
	Remarks	My personal notes regarding the article for quick reference
	Reference graphic	Graphically capture the research theoretical model used in the study (if any).

*See Table 2.8 for details on these attributes

Metadata attributes regarding the articles are also kept as separate instances. These instances include the *use of conceptual reference*, the *level of analysis*, the

operationalization of the construct, and *absorptive capacity reference model*. The details and definition of these metadata attributes (see Table 2.8) are used as the frame for research analytics.

Table 2.8: Metadata attributes

Metadata Attributes	**Classification and Definition**
Use of Conceptual Reference*	• Referenced as minor citation: Used absorptive capacity by citing the major construct (or component), but not explicitly used in the research study • Provided theoretical support: Used absorptive capacity to support its theoretical foundation • Used in hypotheses, proposition, or model: Explicitly used absorptive capacity, integrating it into the authors' conceptualizations • Formed a theoretical base for paper: Used absorptive capacity as a basis for the entire study • Did not refer to absorptive capacity but study related to absorptive capacity: Discussed absorptive capacity from a different perspective • Irrelevant to absorptive capacity: Although the term 'absorptive capacity' was used, the context was not related to the absorptive capacity debate
Level of Analysis**	• Individual • Group/Team • Organization • Inter-Organization • Mixed use of multi-level • Not Explicit
Operationalization of the Construct**	• Capabilities • Resource/Asset • Dual Property • Not Explicit
absorptive capacity Referential Model	• Cohen and Levinthal (1990) • Zahra and George (2002) • Todorova and Durisin (2007) • Mixed use of the model • Used absorptive capacity as a whole entity • Not explicitly called absorptive capacity

* Source: Adopted from the classification by Roberts et al. (2012)

** Source: Adopted from the classification by Lane et al. (2006)

2.3 Nature of knowledge and organization survival

The construct of absorptive capacity starts from the identification and decision to absorb external information through the organization's border, having it assimilated across, transforming it into useful context, and utilizing and storing it as the company's knowledge (Cohen & Levinthal, 1990). The decision of absorbing new information to develop into new knowledge comes from the desire to change for the organization to survive (Bennet & Bennet, 2004). The absorption and transformation of information start with human factors of the organization. These are the knowledge workers (Desouza & Paquette, 2011). Knowledge workers are the fundamental driving forces in developing organizational knowledge. As defined by Nonaka and Takeuchi (1995), organizational knowledge is "the capability of a company as a whole to create new knowledge, disseminate it throughout the organization, and embody it in products, service, and systems" (p. 3). From this definition, organizational knowledge resides in the form of organizational artifacts, which are embedded in the product design and its functionality. It can be in the form of services that reside in the operational processes. It is also in the systems, which includes manufacturing processes and procedures.

2.3.1 Data, information, intelligence, knowledge, and wisdom

The differences between data, information, intelligence, knowledge, and wisdom, are unclear and sometimes used interchangeably. Desouza and Paquette (2011) have given the definition of these terms as:

> …data is raw facts and numbers; information is data that is useful or meaningful to some recipients given a specific context that match the situation the person is exposed to; knowledge is what people believe based on meaningful and

> organized accumulation of information, interpreted, and acted upon; intelligence is the state of knowing something, along with the ability to comprehend a piece of information for a particular purpose; wisdom is accumulated knowledge and experience in a particular context that leads the decision maker to choose to act based on best efforts and rationale (Desouza & Paquette, 2011, p. 36).

In this dissertation, I define data, information, intelligence, knowledge, and wisdom as follows: *data is the raw part of numbers and figures that represent facts from the data collection process*; *information is the processed data applied to context that fits the situations to represent something meaningful to the interpreter; intelligence is a form of analyzed information with presence of alternatives and consequences to support decision-making; knowledge is the information that leads to action with confirmed results of actions and known consequences of the actions; wisdom is the collective and repetitious part of knowledge that applies over and over again over time and to different situations under different contexts to always produces the consistent result.*

2.3.2 Knowledge forms and parts

According to Nonaka and Takeuchi (1995), knowledge has two forms: explicit and tacit form. Explicit knowledge is the knowledge form that is written and kept in a physical form that is easily accessed. It can be in the form of numbers, documents, photograph, pictures, and product artifacts that can be "easily communicated and shared in the form of hard data, scientific formulae, codified procedure, or universal principles" (Nonaka & Takeuchi, 1995, p. 8).

Tacit knowledge is the form that is not easily visible and expressible. It is highly "personal and hard to formalize, making it difficult to communicate or share" (Nonaka & Takeuchi, 1995, p. 8). Tacit knowledge contains two parts the first part is the know how, which is the technical perspective part that includes the skills and experiences; the second part is the cognitive dimension, which consists of schemata, mental models, beliefs, and perceptions.

According to Bennet and Bennet (2013) knowledge has two parts—informing and proceeding. These two parts may also be referred to as an object and human construction (Desouza & Paquette, 2011), and ostensive and performative (Lewin et al., 2011; Salvato & Rerup, 2011). The informing or ostensive part is the information part of the knowledge. It represents "insights, meaning, understanding, expectations, theories, and principles" (Bennet & Bennet, 2008a, p. 3). The proceeding or performative part represents the process and action part of the knowledge. It is "the process of selecting information to develop new information that drives effective action" (Bennet & Bennet, 2008a, p. 3).

The informing part is the explicit type of the knowledge. When two or more persons look at the explicit knowledge, they always see the same thing. For example, when looking at a puzzle containing dots and numbers, everyone sees it and knows it is a dot-connecting puzzle. This is an informing part. However, some people can figure what these dots are when they are connected, which leads to visualizing the end picture in mind. This process of reconstructing is the proceeding part of knowledge. The proceeding part uses tacit knowledge in the process of reconstruction. Each person may have a different ability in reconstructing. For example, two chess players have different sets of skills; one is a novice, the other is an expert. The novice knows

the rules and has some experience playing chess. The expert has the same technical knowledge and understands the rules, but has more in-depth knowledge in pattern recognition of different kinds of settings. This knowledge allows the expert chess player to foresee the moves, and the consequences of the move the novice player is about to make (Bennet et al., 2015).

2.3.3 Organizational memories and knowledge transfer

In the human brain, memory represents the storage of knowledge. The human system is the organic part that contains both explicit and tacit knowledge, while computer storage and memory can contain the explicit. According to Bennet and Bennet (2008), organizational memory is a form of storage that can be expressed in relational term as:

Organizational Memory = Knowledge stored in artifacts
+ Knowledge stored in the heads of its staffs
+ Knowledge stored at the team or group level

This formula represents organizational knowledge to be greater than the sum of individual knowledge. This is because individual knowledge, when exchanged among peers, increases, with people creating new ideas and possibilities by sharing and learning from one another. From these possibilities, some actions can be imposed (Collison & Purcell, 2004). This is where new knowledge is developed.

The diversity of individual disciplines is an important element of sharing and learning together. No one possesses all the knowledge in every area. Knowledge depends on situations and actions. Variety creates a great mix of knowledge and expands the extent of new possibilities (Collison & Purcell, 2004).

"Knowledge creation is a dynamic process beginning at the individual level, then expanding as it moves through communities of interaction that transcend group, departmental, divisional, and organizational boundaries" (Desouza & Paquette, 2011, p. 52). As knowledge expands from level to level up through the organization, knowledge gets retained at every level of the organization in the form of processes, procedures and routines (Bennet & Bennet, 2008a).

Thus, the process of expanding knowledge occurs from the community and social relations between individuals and groups of individuals. Tacit knowledge is best transferred by the means of sharing over time, coaching or mentoring (Bennet, et al., 2015). Mentoring requires good communication between individuals with similar backgrounds and is facilitated through good relationships.

The transfer of knowledge has five essential components: the context to share, the source, the recipient, the channel of sharing, and the message (Desouza & Paquette, 2011). The source processes the knowledge and delivers it to the recipient. The source and recipient must be willing to transfer and accept the knowledge. For tacit knowledge, both source and recipient need to have a similar set of traits in order for the transfer to occur, and for the transfer to be highly efficient, social connections between the two ends ease the transfer (Desouza & Paquette, 2011).

Different forms of channels also impact the ability to transfer. The use of computer technology (such as e-mail) can help the transfer of explicit knowledge. Some other channels such as meetings, coaching, and mentoring (in both their formal and informal expression) can help the transfer of tacit knowledge.

The center element of the transfer is the actual knowledge itself. The source must be capable of processing and sharing while the recipient must be able to absorb, analyze, and synthesize the transferred knowledge.

Desouza and Paquette (2011) define five forms of knowledge transfer: serial, near, far, strategic, and expert: (1) Serial transfer is the transfer of knowledge in one setting to another across the organization; (2) Near transfer is the facilitation of transferring explicit knowledge about certain actions, the tasks that are performed by certain individuals and later become the basis of practices that are to be shared and apply elsewhere in the company; (3) Far transfer is the non-routine task or situation that does not normally occur. This type of knowledge transfer is usually tacit knowledge; (4) The strategic transfer is the transfer of knowledge that arises from non-routine tasks that has an impact on a large part of the organization; (5) The expert transfer is the transfer of non-routine knowledge related to non-routine or unusual problems that occur in one part of the organization with the solution coming from different sets of people.

Transfer of knowledge can go through boundaries. There are three types of boundaries—syntactic, semantic, and pragmatic (Desouza & Paquette, 2011). A syntactic boundary occurs when source and recipient do not share the common language. A semantic boundary occurs when the sharing has surpassed the communicable language, but the context of understanding between the source and recipient is on different ground. A pragmatic boundary occurs when pure communication cannot lead to understanding unless some actions are to be involved. To overcome these boundaries, some of the individuals who play different roles, such as gatekeeper or liaison, could aid the transfer (Desouza & Paquette, 2011). The

gatekeeper performs the bridging between the source and recipient to determine how to acquire knowledge and how to bring across that knowledge. Gatekeepers do not perform the facilitation of knowledge transfer but act as a filter to ensure the right knowledge is being transferred. The liaison is a person who has the network connection between the knowledge source and the recipient through both professional and social networks.

Szulanski (1996) suggests that the knowledge transfer process has four distinct stages: initiation, implementation, ramp-up, and integration. Initiation is the point where the decision is made on which knowledge is to be transferred. The implementation stage begins when resources concerning the transfer are allocated. In this stage, related activities are planned and carried out. This stage ends when the recipient decides to act on the transferred knowledge. The ramp-up stage begins when the recipient starts to employ the new knowledge. New experiences are gained from the implementation, and results regarding the implementation are measured. The final stage is the integration stage where the satisfactory results from the ramp-up stage are realized. The transferred knowledge is to be adopted as a normal practice to become institutionalized.

Explicit knowledge is easy to transfer. When the knowledge is tacit, it becomes harder. According to Pablos (2006), there are five factors that define the ease of knowledge transfer within the organization. (1) The tacitness characteristic of knowledge: The greater the degree of tacitness, the harder the transfer can occur. (2) Social complexity: The higher the level of complexity of social relations inside the organization, the harder the transfer can occur. (3) Causal ambiguity: When the result of the implementation of new knowledge cannot be measured, causal ambiguity

occurs. This will lead to arguments about whether the transfer will bring benefit. (4) Organizational culture distance: This depends on the relationship between units inside an organization. The relationship includes the proximity of attitudes, the level of dependence, and the culture fit of the units. The stronger the organizational culture distance, the harder to transfer the knowledge. (5) National culture distance. This is the factor for the internationally spanned companies with parts and subsidiary offices. The greater the differences in culture, the harder the transfer can occur.

2.3.4 Organizational sustainability

As stated by Kogut and Zander (1992), organizations are "social communities in which individual and social enterprise is transformed into economically useful products and services by the application of a set of higher-order organizing principles" (p. 384). This implies that knowledge of the firms lies in the individuals and connects via social constructs. A firm's knowledge is guided by the firm's principle of conducting business. The growth of the firm is determined by a combination of the speed of technology transfer and the imitative efforts of rivals. To stay competitive, firms must dynamically react to change.

Bennet and Bennet (2004) introduced the theory of Intelligent Complex Adaptive System (ICAS). ICAS is a conceptual model to explain the organization's survival in a dynamically changing environment by adjusting itself to the dynamic threat. They see organizations as complex systems that consist of many interrelated elements with nonlinear relationships that make it difficult to understand and predict. An organization as a complex adaptive system is composed of multiple components whose operations are guided by its business operating principles, having its own rules and procedures, and under its own operating context of relationships with other

components. The intelligent complex adaptive system is the organization steered by individuals who are knowledge workers, using their knowledge and intelligence to drive the business. Organization represents the social connectedness of individuals working in the possible forms of teams, divisions, and department hierarchy.

When the organization is triggered by environmental stimuli, it starts to react by embracing the information flow from outside through its permeable boundaries. The inflow information will go through a selection process, which acts as the funnel to determine if the information is to be assimilated across the firm to develop intelligence about the new change. The selectivity process relies on the organization's shared business purpose, multidimensionality, knowledge centricity, and optimum complexity. The outcome of this process is the new organizational intelligence. The new intelligence will then be transformed to organizational knowledge through the steps of problem solving and creativity to reach the decision to commit actions. Shared purpose allows the firm to adjust and allocate resources to adjust to the change the new information may bring. Optimum complexity balances the organization process stages from too rigid or too loose to find the right combination of complexity in handling the processing of new information. Knowledge centricity is the play rules to allow allocated resources to interact with the new information flows, including the assignment of powerful aids, such as the intelligent agents or the interpreters. Multidimensionality is the organizational flexibility in term of competencies to be developed in association with the new flow of information. These are the organizational capabilities an organization needs to transform information into knowledge.

The ICAS system theory resembles the principle of absorptive capacity. ICAS indicates the fact that the organization needs to adjust itself to changes introduced by the generating of new knowledge. External elements trigger the inflowing of information through the organization boundary, and then the identification of value recognition and acquisition process begins to select the desired information to be processed. The traversal of information must go through assimilation and transformation. These two capabilities involve the elements as described in the ICAS model, including shared purpose, multidimensionality, knowledge centricity and optimum complexity. The exploitation kicks in when the intelligence is developed and imposed with actions to make an impact on the generated new knowledge.

2.4 Absorptive Capacity Developments, Definitions, and Evolution

This section takes a chronological approach and summarizes the developments, definitions and evolution of absorptive capacity in the past 25 years.

Cohen and Levinthal initially conceptualized absorptive capacity in 1989. Since then, the absorptive capacity construct has been discussed and revisited by several scholars (Berghman et al., 2013; Carlo et al., 2012; Tavani et al., 2013; Tiwana & McLean, 2005; Tsai, 2001). Most of this work has focused on either internal capabilities or external factors impacting a firm's absorptive capacity levels.

In this section the development of the construct by Cohen and Levinthal (1989, 1990), the first reconceptualization by Zahra and George (2002), and the revisit on the construct by Todorova and Durisin (2007) is explored. I will then move to the discussion of the internal capabilities of the construct, and will link them to the meta-routines approach as recently suggested by Lewin et al. (2011).

2.4.1 Original construct of absorptive capacity

It was 25 years ago when Cohen and Levinthal (1989) first conceptualized absorptive capacity (Figure 2.4a) as the mechanism under which firms internalize new external knowledge, absorb it and develop it into new knowledge that, in turn, generates innovation and organizational performance. They define this internalization process as the firm's ability to identify, assimilate and exploit new external knowledge to improve the firm's R&D performance (Cohen & Levinthal, 1989), and label this capability as "absorptive capacity". In a following publication (Cohen & Levinthal, 1990), absorptive capacity is revised and defined as "the firm's ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen & Levinthal, 1990, p. 128). This new definition includes R&D activities and the byproduct of R&D, as well as the firm's manufacturing operations and external training of employees.

This latter definition emphasizes the process of absorbing new knowledge but takes also into account the existing knowledge structure that is crucial for related assimilation processes of new information. This conceptualization proposes that absorptive capacity is not just a capability, but that it can also be treated as a firm's valuable asset or resource that builds upon existing knowledge.

Existing knowledge resides in memories. These memories can be individual brains or organizational memories that include routines, processes, procedures, culture, and cooperative norm (Carlile & Rebentisch, 2003; Khoja & Maranville, 2009; O'Reilly & Tushman, 2007; Sun & Anderson, 2010). These memories enhance knowledge. The depth and breadth of knowledge categories in which prior knowledge is organized (Carlo et al., 2012), with the differentiation of knowledge categories

(Cranefield & Yoong, 2007; Henard & Mcfadyen, 2006), supports the ability to acquire new knowledge and determine the variety in a category of knowledge.

Learning is cumulative, and performance is greatest when the object of learning is related to what is already known (Cohen & Levinthal, 1990). This confirms that the newly acquired knowledge —if it fits with the existing structures (Mariano & Casey, 2015)—may contribute a great deal in terms of speed and stability in knowledge adoption (Jansen et al., 2005).

Learning starts with the individuals, and through teams can spread throughout the organization (Lane, Koka, & Pathak, 2006). A firm's absorptive capacity is not the exact sum of the individuals' capacity, but the organizational capability to exploit it (Cohen & Levinthal, 1990). To leverage this capability, the efficiency in transferring knowledge from individuals to teams (or working groups) and, in turn, to organizations becomes a crucial factor. This makes communication and the ability to transfer knowledge an essential factor in disseminating the new knowledge across organizational borders (Desouza & Paquette, 2011). When involving the efficacy in transferring, gatekeepers or boundary-spanners and common communication languages are major factors that define the ability to transfer knowledge (Cohen & Levinthal, 1990; Cranefield & Yoong, 2007; Lichtenthaler & Ernst, 2006; Lu, Su, & Huang, 2010).

Since Cohen and Levinthal (1989, 1990) indicated that absorptive capacity is not relying on just individuals but also the linkages among individuals to construct the combinative and aggregate knowledge structure, absorptive capacity becomes a property at the firm level. Assimilating knowledge across organizational borders requires individuals who are familiar with the social norms of an organization,

understand the activities of each functional unit and the firm's idiosyncratic needs, and are familiar with the process and procedure in handling the message across the organizational boundaries (Cranefield & Yoong, 2007; Elbashir, Collier, & Sutton, 2011; Ernst & Kim, 2002; Fernhaber & Patel, 2012). This coordinating role is necessary and cannot be ignored in the disseminating of knowledge across the organization and its boundaries (Nagati & Rebolledo, 2012).

As per the possible outcome, Cohen and Levinthal (1989, 1990) theorize and show that the absorptive capacity construct brings about improved firm performance and innovativeness. A firm's performance can be improved by R&D activity. R&D activity brings about two benefits. First, it generates innovation that is tightly linked to increasing the firm's financial benefits. Second, R&D activity derives new knowledge that is essential for a firm's competitiveness. Therefore, R&D spending can be used to measure the firm's performance improvement. The R&D spending reflects the R&D intensity, which is the source of new knowledge generation. R&D intensity becomes the factor for firms to appropriate the value from the R&D investment. There are also other moderating factors that leverage the R&D intensity—such as knowledge spillover in the industry, the ease of learning, technological opportunity—that have impact on appropriability (Lane et al., 2006).

2.4.2 Absorptive capacity reconceptualization by Zahra and George

Zahra and George revisited absorptive capacity in 2002, 12 years after the original development of the construct by Cohen and Levinthal (1990). Zahra and George compared and combined absorptive capacity and enhance the construct as "a dynamic capability pertaining to knowledge creation and utilization that enhances a firm's ability to gain and sustain a competitive advantage" (Zahra & George, 2002, p. 185).

Combining the concept of dynamic capability with the absorptive capacity construct enhances the research areas in exploring new antecedents and consequences.

Dynamic capability is the firm's ability to adjust to organizational change by dynamically altering its available resources to improve the firm's competitive advantage (Teece et al., 1997). Dynamic capability debate uses a Resource Based View (RBV) as its foundation (Ambrosini & Bowman, 2003; Eisenhardt & Martin, 2000; Grant, 1996). In this sense, Zahra and George (2002) look at knowledge as a Valuable, Rare, Inimmitable, and Non-substitutable (VRIN) resource (Ambrosini & Bowman, 2009; Biedenbach, 2009; Eisenhardt & Martin, 2000; Teece et al., 1997). Dynamic capability also provides pathways involving organizational changes to undertake the new absorbed knowledge to adjust for the firm's competitiveness (Raisch & Birkinshaw, 2008; Rothaermel & Alexandre, 2009; Teece et al., 1997).

Zahra and George (2002) reify the construct by adding transformation as another internal capability such that the construct has four sub-components—knowledge identification, assimilation, transformation, and exploitation—with sequential step relations. They argue that transformation is the key activity in realizing and combining new knowledge into the existing knowledge structure to gain new insights, recognize new opportunities, and allow the firm to gain an advantage in competition.

Highlighted in Table 2.9 are the definitions of the internal capabilities. These breakthrough definitions are referenced by many researchers (Berghman et al., 2013; Flatten, Engelen, Zahra, & Brettel, 2011; Fosfuri & Tribó, 2008; Lane et al., 2006). I will also refer to these definitions throughout this research study.

Table 2.9: Definitions, Components and Roles of absorptive capacity internal capabilities

Capability	Definition
Acquisition	The firm's capability to identify and acquire externally generated knowledge.
Assimilation	The firm's routines and processes that allow analyzing, processing, interpreting, and understanding the information obtained from external sources.
Transformation	The firm's capability to develop and refine routines that facilitate combining existing knowledge with the newly acquired assimilated knowledge.
Exploitation	The firm's capability routines that allow refining, extending, and leveraging existing competencies or creating new ones and transforming knowledge into its operations.

Source: Adapted from Zahra and George (2002, p. 189)

Zahra and George (2002) gave abbreviation to absorptive capacity as ACAP. They indicated that ACAP was composed of two subsets, Potential and Realized ACAP, with the abbreviations as PACAP and RACAP, respectively. PACAP includes the capabilities to acquire and assimilate external knowledge, and RACAP contains the capabilities of transformation and exploitation of newly generated knowledge. The potential of ACAP makes the firm receptive to acquiring and assimilating external knowledge (Lane & Lubatkin, 1998). This means that the higher the level of PACAP, the greater the ability of the firm to absorb new external knowledge. Realized ACAP reflects the firm's ability to transform and utilize the newly acquired and assimilated knowledge. PACAP is used for the identification of the potential absorptive capacity, while the RACAP is the capacity to turn the knowledge into the firm's performance. In other word, RACAP is the capability for the firm to achieve a new goal while PACAP is the firm's enabler to sustain competitive advantage.

Zahra and George's (2002) reconceptualization of the construct have stimulated tremendous attention around the absorptive capacity debate, and many studies have

emerged in specific clustering areas. Table 2.10 summarizes the research conducted after the reconceptualization, that is, from 2002 until 2014.

Table 2.10: Research studies based on Zahra and George's (2002) reconceptualization of absorptive capacity

Research Area	**Research boundary**	**Research Citation**
Knowledge transfer and stickiness	Transfer of knowledge within and across geographical regions between parent and partner firms and knowledge stickiness	(Abecassis-Moedas & Mahmoud-Jouini, 2008; Camisón & Forés, 2011; Ghauri & Park, 2012; Law, 2013; Malhotra, Gosain, & Sawy, 2005)
Social Capital, Marketing Capital	Explore social and marketing capital impact on ACAP, PACAP, and RACAP	(Roxas, 2008; Sherif, Munasinghe, & Sharma, 2012)
Organization structure and strategy	Study focused on the change of organizational structure and strategy to adjust to new level of ACAP	(Jones & Hecker, 2003)
Role and responsibility of knowledge transfer agent	Roles and responsibilities of gatekeepers or other knowledge agents to ensure the smooth transfer across internal borders	(Lazaric, Longhi, & Thomas, 2008)
Antecedent factors of ACAP	Explore antecedent factors of ACAP	(Cepeda-Carrion, Cegarra-Navarro, & Jimenez-Jimenez, 2012; Fosfuri & Tribó, 2008; Penghu & Xiaojin, 2014; Vega-jurado et al., 2008)
Internal factors of ACAP	Explore relationship of PACAP and RACAP	(Branzei & Vertinsky, 2006; Jansen et al., 2005; Melkas, Uotila, & Kallio, 2010; Mursitama, 2011; Techatassanasoontorn, Tapia, & Powell, 2010; Yeoh, 2008)
ACAP and firm's performance	Determine factors to have impact on ACAP and firm's performance	(Andersén & Kask, 2012; Descotes & Walliser, 2013; Popaitoon & Siengthai, 2014)
ACAP measurement	Identify measurement variables for internal capabilities of ACAP	(Flatten et al., 2011)
ACAP and Organizational Learning	The combining of ACAP and the theory of organizational learning	(Sun & Anderson, 2010)

2.4.3 Absorptive capacity revisited by Todorova and Durisin

Todorova and Durisin (2007) propose a new conceptualization of absorptive capacity. The model is based on the original Cohen and Levinthal (1990) construct combined with the enhanced proposal from Zahra and George (2002). By

reconstructing the relations, the idea of separating absorptive capacity into PACAP and RACAP is not valid anymore. Grouping the internal capabilities into two subgroups requires a thorough study on the impact that the two groups have on one another.

Todorova and Durisin (2007) introduced the gateway component of absorptive capacity and named it “Recognize the value”. This is the individual level function to be aware and understand the new knowledge, and make decisions either to include or discard the new knowledge into the firm. Recognizing the value is exercised by the power figures that have an impact on the firm’s strategy and directions. These actors can be the customers, the regulators, the stakeholders, or even the firm’s owners.

Todorova and Durisin (2007) use cognitive structure to explain the organization of the construct to have transformation and the alternate component of the assimilation. The cognitive structure (Garner, 2007; Piaget, 1952) explains that when a newly absorbed idea can fit directly into the firm’s existing knowledge structure, this is called assimilation. However, if the newly absorbed knowledge does not fit and requires altering to fit into the existing knowledge structure, then this mechanism is called transformation. The piece of new knowledge can be moved back and forth between the two components before being exploited as part of the firm's new knowledge structure.

Todorova and Durisin (2007) decide to enhance the finding of Cohen and Levinthal (1989, 1990) by suggesting that transformation is another necessary capability when absorbing knowledge into the firm, and is a parallel component to the assimilation of knowledge.

Another key component that Todorova and Durisin (2007) add to the construct is the feedback link loop. The link provides the completion of the cycle that captures the dynamic aspect. The new knowledge developed through the cyclical process of knowledge absorption becomes part of the organizational knowledge base, which then serves as part of the knowledge foundation for another cyclical acquisition of new external knowledge. Adding this feedback loop allows absorptive capacity to capture the dynamism. "The development of absorptive capacity is a path-dependency process, and the increase of knowledge in an area of expertise at any point in time fosters the future development of capabilities" (Todorova & Durisin, 2007, p. 782). According to system dynamic theory (Senge, 2006), this strengthens the absorptive capacity construct.

Todorova and Durisin's (2007) conceptualization clusters around the original construct of Cohen and Levinthal's (1990) foundation and enhances it with three necessary components to formulate and utilize the construct—(1) transformation as a parallel structure of assimilation; (2) recognizing value as the primary activity at the individual level to trigger the acquisition, and (3) the addition of a feedback loop to enhance the dynamism of the cyclical approach. Working around the original construct ensures that the refinement of the construct does not deviate from the primary intention and too much of reification (Lane et al., 2006). Thus, the originality of meaning is preserved. For this reason, Todorova and Durisin's (2007) conceptualization as it appears in Figure 2.4 (c) will be the referential base model throughout my research study.

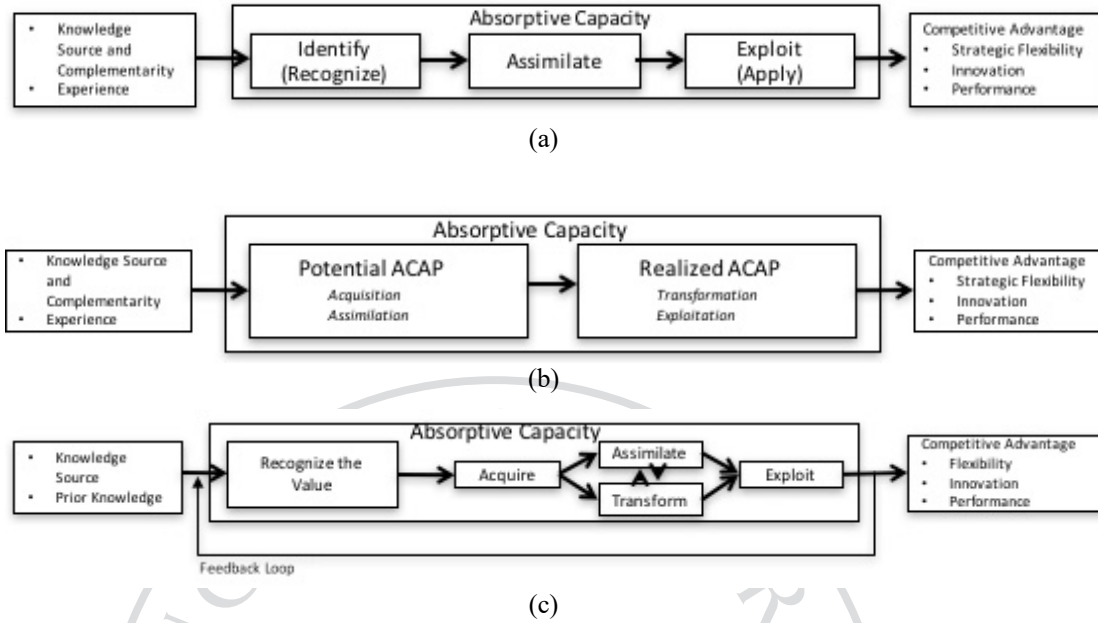


Figure 2.4: Evolution of absorptive capacity construct: (a) Cohen and Levinthal (1990), (b) Zahra and George (2002), and (c) Todorova and Durisin (2007)

Source: Adopted from Todorova and Durisin (2007, p. 775-776)

2.4.4 Dynamic capability and ambidexterity

Since absorptive capacity and dynamic capabilities have been tightly linked together by many researchers (Eisenhardt & Martin, 2000; Kogut & Zander, 1992; Teece et al., 1997; Zahra & George, 2002), I will briefly explore the concept of dynamic capability.

The term dynamic capability ties together two strong concepts. First, *Dynamic* means “the capacity to renew competences so as to achieve congruence with the changing business environment” (Teece et al., 1997, p. 515). Second, *Capability* means “the key role of strategic management in appropriately adapting, integrating, and reconfiguring internal and external organizational skills, resources, and functional

competences to match the requirements of changing environment" (Teece et al., 1997, p. 515). Various researchers have defined the combined term, i.e. dynamic capability and Table 2.11 provides a summary of these definitions.

Table 2.11: Dynamic capability definitions

Dynamic capability definition	**Cited reference**	**Implications and Connotations**
The firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments.	Teece et al., 1997, p. 516	First attempt to define dynamic capability concept
Processes that the firm can use as resources—specifically, the processes to integrate, reconfigure and release resources—to match, and even create, market change.	Eisenhardt & Martin, 2000, p. 1107	*Resource configuration* (Eisenhardt & Martin, 2000) leads to *New market positioning* (Teece et al., 1997)
A learned and stable pattern of collective activity through which the organization systematically generates and modifies its operating routines in pursuit of improved effectiveness.	Zollo & Winter, 2002, p. 4	Organizational learning addressed as the source of dynamic capability
The capacity of an organization to purposefully create, extend, and modify its resource base.	Helfat et al., 2007, p. 4	Dynamic capability involves with alteration and allocation of organizational resources.
Knowledge-based dynamic capability has been identified as the process of acquisition, assimilation, transformation, and exploitation.	Denford, 2013; Zahra & George, 2002	Dynamic capability and absorptive capacity treated as the same (in the view of knowledge as a resource)

Referring to multiple versions of definitions, dynamic capabilities enable the firm to respond to dynamic challenges in the business environment (Gebauer, Worch, & Truffer, 2012) by adjusting its internal and external resources and routines where appropriate (Easterby-Smith et al., 2008).

The word *resource* refers to the tangible, intangible, human assets, and capabilities which the organization owns, controls, or has access to on a preferential basis (Helfat et al., 2007) that are difficult to imitate (Teece et al., 1997). Dynamic capability exploits the theory of the Resource Base View (RBV) in the sense that the firm's

competitive advantage depends on the VRIN (Valuable, Rare, Imitable, and Non-substitutable) resources (Ambrosini & Bowman, 2009). The firm's production of value—hard to find competitions, hard to replicate or imitate products or services—give the firm competitive advantage (Eisenhardt & Martin, 2000; Teece et al., 1997). Knowledge can be viewed as a firm's specific resource (Zahra & George, 2002). Treating knowledge as a firm resource is also conceptualized in the *Knowledge Base View* (KBV) of the firm theory (see, for example, Culpan, 2008). Viewing knowledge as a resource can lead to competitive advantage in that knowledge resources can grow through the recombination of existing capabilities and the exchange of knowledge across organizations (Kogut & Zander, 1992).

KBV has two unique characteristics (Culpan, 2008). First, KBV is heterogeneous. This means that the knowledge is uniquely based on each firm which owns it. No firm has exactly the same kind of knowledge, and all knowledge is context sensitive and situation dependent (Bennet & Bennet, 2008). This means that the application of knowledge will be different in different situations. Therefore, this application of knowledge resides very much within each firm who has met different situations, and becomes a competitive factor. Secondly, knowledge assets are embedded in the firm. It is very hard to transfer all knowledge from one firm to another (Kalling, 2003). While information can be transferred, the unique way it is combined and used (knowledge proceeding) resides within the individual or the firm, and is generally tacit and not easily transferred (Bennet & Bennet, 2008). Although the transfer can be eased through the process of mentoring, but the entirety of the "lived" experiences cannot be transferred (Bennet & Bennet, 2008; Bennet & Bennet, 2008b).

RBV differs from KBV in that resources in RBV are available throughout the organization (Helfat & Peteraf, 2009). For KBV, knowledge is generated at the individual level and is integrated throughout the rest of the organization through knowledge assimilation and transformation (Kogut & Zander, 1992). Another major difference in RBV and the Knowledge Based View (KBV) of the firm is that the resource in RBV is disposable and consumable, while the KBV is not (Eisenhardt & Martin, 2000). It resides in the organization in the form of organizational memories.

The objective of dynamic capability is about understanding a firm's survival and growth to generate the firm's sustainable competitive advantage. To grow, firms need to keep developing expertise. To innovate, firms need to have entrepreneurial skills, rather than managerial skills (Ambrosini & Bowman, 2009). Dynamic capabilities enable business enterprises to create, deploy, and protect intangible assets that support superior long-term business performance (Teece, 2007).

According to Teece (2007), dynamic capability consists of three processes—Sensing, Seizing, and Reconfiguring. Sensing is the process to sense and to shape opportunities or threats. Seizing is to capture the opportunity. Reconfiguring is to adjust and maintain the competitive advantage through enhancing, combining, protecting, and recombining/reconfiguring the firm's intangible and tangible assets. Treating dynamic capability in the context of absorptive capacity can be done in the following three manners: sensing can be compared to the identification capability of absorptive capacity; seizing can be compared to the assimilating capability; and recombining/reconfiguring can be compared to the transformation and exploitation capabilities.

The ability to create and sense opportunities requires both access to information and the ability to recognize, sense, and shape developments. This requires the enterprise to have internal processes to embed scanning, interpretation, and creativity (Teece, 2007). The decision-making process in acquisition is to identify the technology and features that are to be embedded in the organizational knowledge base, the consideration of cost in business or service models, the market, the value returns to the firm and the business ecosystem. At this point, absorptive capacity has been considered a subset of dynamic capability. According to Teece (2007): "The capacity an enterprise has to create, adjust, hone, and, if necessary, replace business models is foundational to dynamic capabilities" (p. 1330).

In sensing and seizing new knowledge to develop opportunities for new business, firms rely on their capability to explore and exploit new knowledge. These dual capabilities are called *Ambidexterity* (O'Reilly & Tushman, 2007). Ambidexterity uses the existing firm's resources, capabilities, and reconfiguration to address new opportunities. In other words, ambidexterity is the firm's ability to learn using exploration and exploitation mechanisms. However, ambidexterity must be in balance to find the right mix between known and unknown technological knowledge in the organization (Rothaermel & Alexandre, 2009). The exploration process involves the acquisition and assimilation of external technology sourcing, and exploitation involves the transformation and exploitation in term of absorptive capacity. Table 2.12 compares and summarizes dynamic capabilities and absorptive capacity key characteristics.

Table 2.12: Key characteristics comparison between dynamic capability and absorptive capacity

Characteristics	Dynamic Capability	Absorptive Capacity
Knowledge source	Considers both the external and internal (Lichtenthaler & Lichtenthaler, 2009).	Only information from external(Cohen & Levinthal, 1989).
Resource base vs. knowledge base view of the firm	Considers resources as valuable, rare, imitable, and non-substitutable. Resources are available to entire organization through the ambidextrous process of exploration and exploitation (Denford, 2013).	Considers knowledge as resources that must be internalized into the organization through the process of assimilation and transformation (Cohen & Levinthal, 1990).
Knowledge integration process	Through the process of sensing, seizing, and reconfiguring (Teece et al., 1997).	Through the process of acquisition, assimilation, and exploitation (Cohen & Levinthal, 1990).

Exploration and exploitation capabilities as defined in ambidexterity can explain the absorptive capability internal capabilities. Exploitation is a short-term solution, adapting new knowledge to yield quick and immediate performance (Raisch & Birkinshaw, 2008). Exploration is a longer-term solution using the capability of learning, integrating, reconfiguring, and transforming new market opportunities and technologies through new activities, such as new product development, joint ventures, and cross line business innovation (O'Reilly & Tushman, 2007; Raisch & Birkinshaw, 2008). It refers to learning activities such as search, variation, experimentation, and discovery (March, 1991).

Another key component of dynamic capability is the consideration of source of information—that information can be from either an external or an internal source—while absorptive capacity considers only externally acquired information flowing into the organization (Cohen & Levinthal, 1990). This characterizes knowledge generation

as a path-dependency process with equifinality, i.e. the final outcomes can derive from different approaches depending on the use of different process paths (Easterby-Smith et al., 2008; Peeters et al., 2014; Zollo & Winter, 2002). This is a dominant characteristic of absorptive capacity as well (Cantner & Joel, 2011; Cohen & Levinthal, 1990; Yeoh, 2008).

2.4.4.1 Discussion on dynamic capabilities and limitations

The Resource Based View (RBV) of the firm conceptualizes internal capabilities as a way to ensure resources exploitation (Eisenhardt & Martin, 2000). According to RBV a firm is conceptualized as a bundle of resources that are heterogeneously distributed. However, the RBV does not explain why some firms have high competitive advantage when they are in a rapid and unpredictable environment, just like a fast-moving, high-technological market sector. The RBV does explain the construct of a business model in the moderate-moving market sector, but not seem to hold for the fast-moving market sector (Teece, 2007). This means that when reconfigurations of organizational structure are involved, they will require time and a certain amount of resources alteration. Contrarily to the RBV, the knowledge based view (KBV) of the firm conceptualizes knowledge as a resource that can be altered quickly to respond to changes required by a high-velocity market. This is the reason why the RBV encounters the boundary conditions of a high-velocity market and can potentially become unstable (Peteraf, Di Stefano, & Verona, 2013).

Another important consideration relates to sustainability. Dynamic capabilities are considered a short-term solution to provide competitive advantage. The condition to obtain long-term sustainability occurs only when competitors have low capability of replication (Teece et al., 1997). Eisenhardt and Martin (2000) point out those dynamic

capabilities can be considered a firm's best practice. Since dynamic capabilities have equifinality and path dependency characteristics, the implementation of best practice across a firm varies in the way of practicing to reach the same expecting outcome (Peteraf et al., 2013).

2.4.4.2 The evolution of dynamic capabilities

When Teece et al. (1997) and Eisenhardt and Martin (2000) conceptual framework of dynamic capabilities was developed based on the entrepreneurial theory, new research works was also developed based on the evolutionary theory. The evolutionary theory approach studied the creation on new dynamic capabilities conceptual framework based on the way the entrepreneurs modify the organizations and use resources to survive in changing environments; the way the organization strives to survive in a changing environment; and the successful management to sustain and retain in business (Jones & Hecker, 2003).

Zott (2003) proposed a new dynamic capabilities conceptual framework that included variation, selection, and retention capabilities. These capabilities were grouped together and labelled as resource configuration. The resource configuration linked capabilities to a firm's performance, which resulted in a competitive advantage. However, linking dynamic capabilities directly to a firm's performance had been unclear. One exception was the construct of intermediary capability that was empirically proven to lead to firm's performance (Zott, 2003). However, Zott's (2003) construct still requires examination into the mechanisms of absorption of new knowledge and resources that could lead to a firm's performance and competitive advantage.

A subsequent study of Wang and Ahmed (2007) clarified some aspects of dynamic capabilities and proposed antecedents and descendent factors that were developed using hierarchical order of elements. According to this reconceptualization, core capabilities, which included integration, renewal, reconfiguration, and re-creation were defined as the dynamic capabilities foundation. A higher order empirical construction composed of 3 sub-capacities–Adaptive, Absorptive, and Innovative capabilities–was also added to overcome the limitations related to sustainability issues.

Wang and Ahmed's (2007) construct incorporated market dynamism as a factor that impacted dynamic capabilities. The more dynamic the market environment, the stronger the drive for firms to exhibit dynamic capabilities. It was proposed that dynamic capabilities, together with firm's strategy, were likely to lead to better performance.

2.4.4.3 Relations of dynamic capabilities and absorptive capacity

Dynamic capabilities literature argued that absorptive capacity was a pivotal part of the overarching dynamic capacities. However, previous research of dynamic capabilities only considered absorptive capacity marginally. While research on absorptive capacity had its clear focus on the firm's mechanisms of absorbing new external knowledge, assimilate it and transforming it to reach a firm's competitive advantage, researches on dynamic capabilities tried to define the construct and looked for mechanism to explain the broader area of knowledge generation and absorption. Research on dynamic capabilities based their theory on the Schumpeterian entrepreneurial of innovation-based competition (Eisenhardt & Martin, 2000; Pavlou

& El Sawy, 2006; Peteraf et al., 2013; Teece et al., 1997) or on the theory of organizational evolution (C. L. Wang & Ahmed, 2007; Zott, 2003).

Pavlou and El Sawy (2006) based their construct on Teece et al.'s (1997) conceptual framework and proposed that dynamic capabilities had core processes of sensing, learning, coordinating, and integrating. These core processes were bundled together and named reconfiguring process. The sensing capability dealt with the market dynamisms. The learning capability dealt with knowledge needed to support the change or reconfiguring of a firm's operations. Coordinating capabilities dealt with the logistics of allocating resources, the implementing of the plan to reconfigure the resource, and the management of reconfiguration activities. The integrating capability dealt with the actual implementation of change.

As reported in Figure 2.5, it is clear that Wang and Ahmed (2007) re-conceptualized dynamic capabilities by separating a 1st order level, that is integration, reconfiguration, renewal, and recreation of resources, from a 2nd higher order level which includes adaptive capability, absorptive capability, and innovative capability. As such, absorptive capacity is an undermining part of dynamic capabilities, focusing on knowledge absorption, and not responding to market opportunity or innovating. This clearly indicated that the dynamic-capability-based view considered the perspective of operational-process-based view on how resources were acquired and utilized, while the absorptive-capacity-based view considered the knowledge perspective and how knowledge was developed from information and traverse through the mechanisms of absorption and integration to reach competitive advantage. At this point the idea of treating dynamic capabilities as ambidexterity (Fernhaber & Patel, 2012; O'Reilly & Tushman, 2007; Raisch & Birkinshaw, 2008; Rothaermel &

Alexandre, 2009) was seen as more appropriate with the clear intention to separate the knowledge generating process from external or internal sources.

<table>
<tr><td colspan="2">Authors</td><td>Teece et al. (1997)</td><td colspan="2">Pavlou & El Sawy (2006)</td><td colspan="2">Zott (2003)</td><td colspan="2">Wang & Ahmed (2007)</td></tr>
<tr><td colspan="2">Theoretical Foundations</td><td colspan="3">Entrepreneurial</td><td colspan="2">Evolutionary</td><td colspan="2"></td></tr>
<tr><td colspan="2">Terminologies</td><td colspan="3">Processes</td><td colspan="2">Mechanisms</td><td colspan="2">Competences</td></tr>
<tr><td rowspan="3">1st order level Dynamic Capabilities (DC)</td><td rowspan="3">2nd order level DCs</td><td>Learning</td><td rowspan="3">Reconfiguration as a latent second order construct</td><td>Sensing</td><td rowspan="3">Reconfiguration through Experimentation & Imitation</td><td>Variation</td><td rowspan="3">Reconfiguration through higher order DCs</td><td>Adaptive</td></tr>
<tr><td>Reconfiguration</td><td>Learning</td><td>Selection</td><td>Absorptive</td></tr>
<tr><td>Coordination / Integration</td><td>Coordinating</td><td>Retention</td><td>Innovative</td></tr>
</table>

Figure 2.5: Summary of Dynamic Capabilities literature review

Source: Own elaboration with credit to Xavier Parisot, IKI-SEA, Bangkok University

From the operational-process-based view, dynamic capabilities alone could not link directly to a firm's performance and competitive advantage. An intermediary of operational capabilities was required. Dynamic capabilities was considered as an antecedent to deliver the new operational capabilities, having market turbulence as moderating variable (Pavlou & El Sawy, 2006). From an absorptive capacity standpoint, the whole mechanism drove toward the firm's performance and competitive advantage. The two constructs considered how a firm reacted to the threat of environmental changes, although they did it from different perspectives.

Figure 2.6 shows the combination of dynamic capabilities elaborated from previous work (i.e., Eisenhardt & Martin, 2000; Helfat & Peteraf, 2009; Nonaka, Hirose, & Takeda, 2016; Pavlou & El Sawy, 2006; Teece, 2007; Teece et al., 1997; C. L. Wang & Ahmed, 2007; Zott, 2003). Dynamic capabilities evolution starts from the micro-evolutionary level (the routine specific level), although different scholars addressed different routines. Operational capabilities are directly connected to

organizational performance. Thus, dynamic capabilities can be conceptualized as antecedents of operational capabilities. Market dynamism influences the firm's dynamic capabilities (Wang & Ahmed, 2007) while firm's strategy influences operational capabilities. Market dynamism, also referred to as market turbulence (Pavlou & El Sawy, 2006), includes technological innovation, regulatory changes, economic cycles, and competition changes (Wang & Ahmed, 2007).

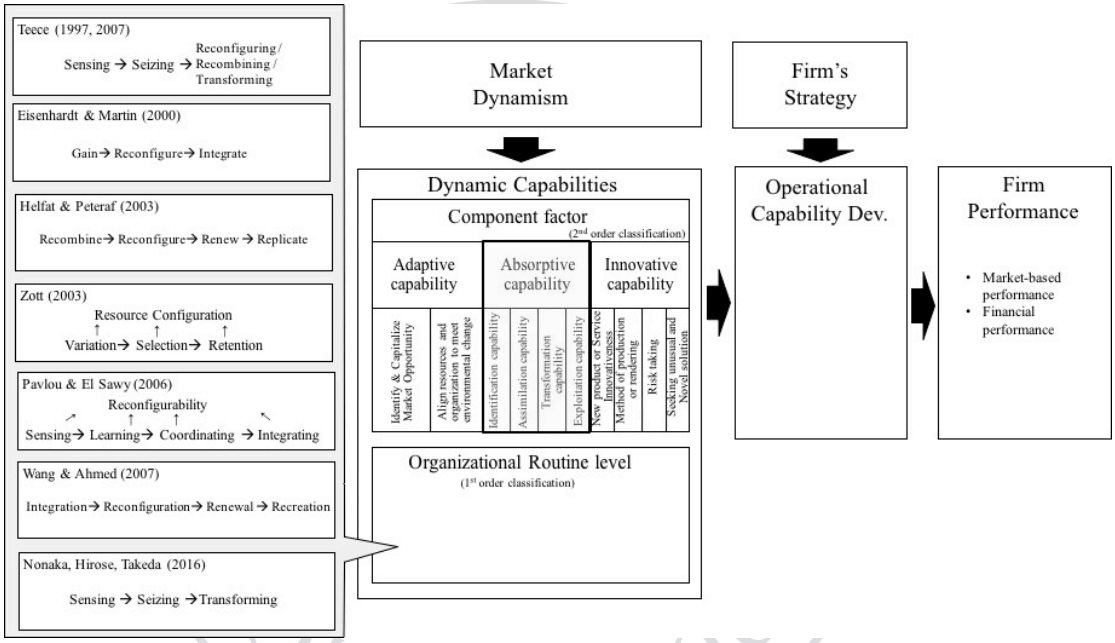


Figure 2.6: Dynamic capabilities integrating to operational capability development to deliver firm performance

2.4.5 Exogenous and endogenous factors of absorptive capacity

Absorptive capacity reconceptualizations and further developments also consider the relating mechanisms and factors that have direct impact on the construct. These factors are termed exogenous and endogenous (Zahra & George, 2002). Exogenous factors are factors that are driven by external forces—for example, regulations, standards, customer needs, laws, etc. Firms do not have control over these forces.

Endogenous factors are factors that are driven from internal forces—for example, culture, norms, policy, procedures, etc. In this section, I will explore the factors that impact each conceptualization of the absorptive capacity construct, with specific reference to the work of Cohen and Levinthal (1990), Zahra and George (2002), Todorova and Durisin (2007), and to the review conducted by Lane et al. (2006).

Cohen and Levinthal (1990) use R&D spending as the indicative measures of R&D intensity, which reflects the level of absorptive capacity. They also relate this assumption to the level of appropriability of R&D spending. Cohen and Levinthal (1990) define appropriability as "the degree to which firms capture the profits associated with their innovative activity and are often considered to reflect the degree to which valuable knowledge spills out into the public domain" (p. 139). If the level of potential appropriability of the return on investment is high, then the R&D intensity and the R&D investment are also high. However, appropriability is affected by the level of knowledge spillover (Cohen & Levinthal, 1990). The level of knowledge spillover depends on the strength of the patents, the efficiency of secrecy, and the first-move advantages. In the market where patent violation enforcement is not strong, there will be high knowledge spillover (Gebauer et al., 2012).

Two other factors that impact the incentive for a firm to invest in R&D to gain new knowledge are the quantity of knowledge to be assimilated and exploited, and the difficulty or the ease of learning (Cohen & Levinthal, 1990). If the knowledge is of high quality, the cost associated with the assimilation and exploitation of knowledge will be high. This applies to the ease of learning as well. If the knowledge is difficult to learn, more prior knowledge has to be accumulated. This means that the cost of assimilation and exploitation will also be high (Cohen & Levinthal, 1990) .

Zahra and George (2002) determine two significant factors in addition to appropriability. These are the activation triggers and the social integration mechanisms. The activation triggers are events that excite the firm to respond to the stimuli (Zollo & Winter, 2002). Internal triggers can be the result of R&D, a technology shift, organizational change, internal policy and strategy changes, etc. External triggers can come in many forms, including government policy and regulations, technical standards, competitor threats, etc. When the trigger occurs as an external factor, this is classified as an exogenous factor.

Other additional factors of Zahra and George's (2002) model are social integration mechanisms. Social integration mechanisms are endogenous factors. Social integration mechanisms facilitates the sharing of knowledge across the entire organization and become the only variables that involve all unit levels from individual knowledge transfer, to groups and teams, to interdepartmental units, up to the organizational level. Social integration mechanisms help lower the knowledge transfer barriers (Todorova & Durisin, 2007).

Compared to previous conceptualizations, Todorova and Durisin (2007) introduce a new *power relationship* factor that impacts absorptive capacity in addition to appropriability, triggers, and social integration mechanisms. Power relationships represent the influential actors who have control and authority to make a decision that accommodate the knowledge absorption (Todorova & Durisin, 2007). Power actors can reside externally or within the organization. These actors can be the organization's leaders, customers, stakeholders, and regulators. These power actors have an influential effect on the decision to acquire new information. The intervention of the power figure always appears as an endogenous factor. The intervention as an

endogenous factor occurs inside an organization and always comes from the organization's management team to alter the organizational structure with the resource allocation process to support the newly assimilated knowledge.

Lane et al. (2006) conducted a review of how absorptive capacity was used and reified. They explored the antecedent, moderating and outcome variables of the construct, starting from the drivers that trigger a firm to decide on absorbing new information. Drivers are both external and internal in nature. The external drivers have two components. The first component is a similar structure of knowledge between the firm and learning partners. The second component is the relationship that facilitates the learning. This includes issues such as strategies, culture, structure, and compensation. The internal drivers have three components. The first component is the organizational structure that fits and urges the assimilation and transformation of new knowledge. The second component is the motivation or incentive of employees. The individual is the starting point of the chain of knowledge absorption; individual cognition is the basic form of a firm's absorptive capacity. Individual and shared mental models can disseminate new insights of what the firm recognizes as valuable. The third comprises the organizational structure and processes. This includes policies, procedures, knowledge transfer, sharing mechanisms, and knowledge integration.

2.4.6 Duality of absorptive capacity

Research scholars have been treating absorptive capacity in a duality mode. Some research studies focus on the property of absorptive capacity as internal capabilities having processes and procedures for handling the internalization of new knowledge (Alin, Taylor, & Smeds, 2011; Flatten et al., 2011; Lane, Salk, & Lyles, 2001; Lewin et al., 2011; Lichtenthaler, 2005; Salvato & Rerup, 2011; Yeoh, 2008) others regard it

as an organizational asset or resource that pertains to the acquisition of new knowledge based on existing knowledge capacity (Abecassis-Moedas & Mahmoud-Jouini, 2008; De Boer, Van Den Bosch, & Volberda, 1999; Park, 2011).

Consequently, absorptive capacity can be viewed as the "knowledge stock or asset" of prior knowledge, or the "ability" to absorb knowledge. Viewed as an asset, this static perspective of knowledge is treated as a firm's knowledge base, e.g., level of knowledge (Roberts, Galluch, Dinger, & Grover, 2012). The level of prior knowledge plays an important role in the acquisition and assimilation of new information to develop into a new stock of the firm's knowledge (Nair, 2011). A higher level of prior knowledge reflects in the ease of learning, that is, as the level of effort in accepting and integrating into the existing knowledge base compared to a firm with a low level of prior stock (Chen, Lin, & Chang, 2009).

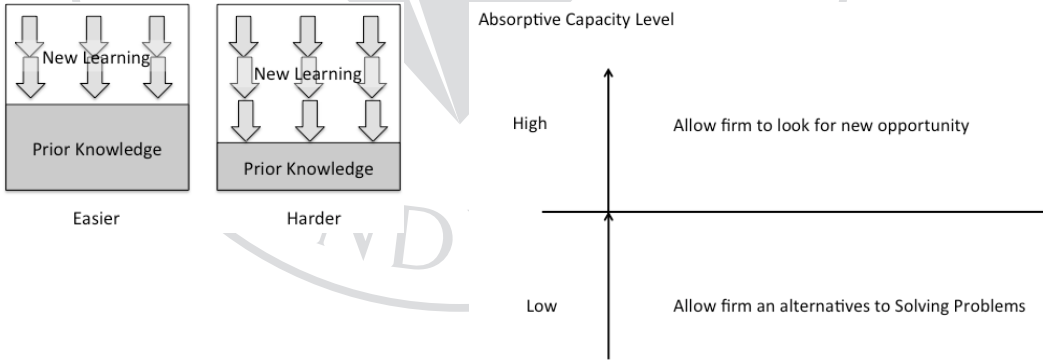


Figure 2.7: The level of knowledge represented in (a) ease of absorbing and (b) the opportunity of knowledge utilization

According to Tiwana and McLean (2005), a high level of firm prior knowledge allows a firm to look for new opportunities (see Figure 2.7). Comparing to a firm with

a lower level of stock of knowledge, there is larger room for new information absorption. Thus, this enables the firm to find alternate ways of solving the problem (Ambrosini & Bowman, 2003). Activities will be utilized based on the available knowledge specific domain, but will not be able to go across the boundary of that domain (Roberts et al., 2012).

The idea of treating absorptive capacity as an asset or resource is opposed by many researchers (Lane et al., 2006; Mariano & Walter, 2015; Roberts et al., 2012; Robertson et al., 2012). Viewed as an ability, absorptive capacity is considered as routines or processes that involve decision making for acquiring, processing, and applying the new knowledge gained for commercial value (Roberts et al., 2012). "Possessing relevant prior knowledge is a necessary but not sufficient condition for a firm to have absorptive capacity" (Lane et al., 2006, p. 852). This theoretical conceptualization of absorptive capacity views it as a firm capability more than as an asset.

2.4.7 Absorptive capacity and meta-routines

More recently, Lewin et al. (2011) reviewed the construct of absorptive capacity and proposed a micro-foundation perspective of its internal capabilities. They decomposed the construct of absorptive capacity into two capabilities—internal and external—and identified the configuration of meta-routine capabilities to serve as guidelines for explorations.

According to Lewin et al. (2011), routines consist of rules, standards, operating procedures, norms, habits, and organizational values. "Meta-routines are higher-level routines that are associated with a bundle of specific operational lower-level routines or standard operating procedures (practiced routines) that express these meta-

routines" (Lewin et al., 2011, p. 84). Meta-routines have been theorized as mechanisms for generating dynamic capabilities (Teece et al., 1997). Meta-routines are sometimes referred to as the routines to change routines (Feldman & Pentland, 2003).

Routines are the basic building block of organizational capabilities as they contain the know-how to do things, including problem-solving and decision-making algorithms (Lewin et al., 2011). Routines are specific to each organization and context sensitive. Routines can be regarded as organizational memories containing the collective knowledge of individuals and inter-departments (Bontis, 1999; Carlile & Rebentisch, 2003; Chakravorti, 2011; Lane et al., 2006; Mariano & Walter, 2015; Roberts et al., 2012). They sometimes are considered as a source of inertia, and can also be a source of flexibility (Feldman & Pentland, 2003). Change in routines occurs when there is a crisis or ambiguity, but they also can be changed to force improvements in the organization. This is the reason why routines can be regarded as an inert element from a repetitive pattern of operations as well as a conveyer for change.

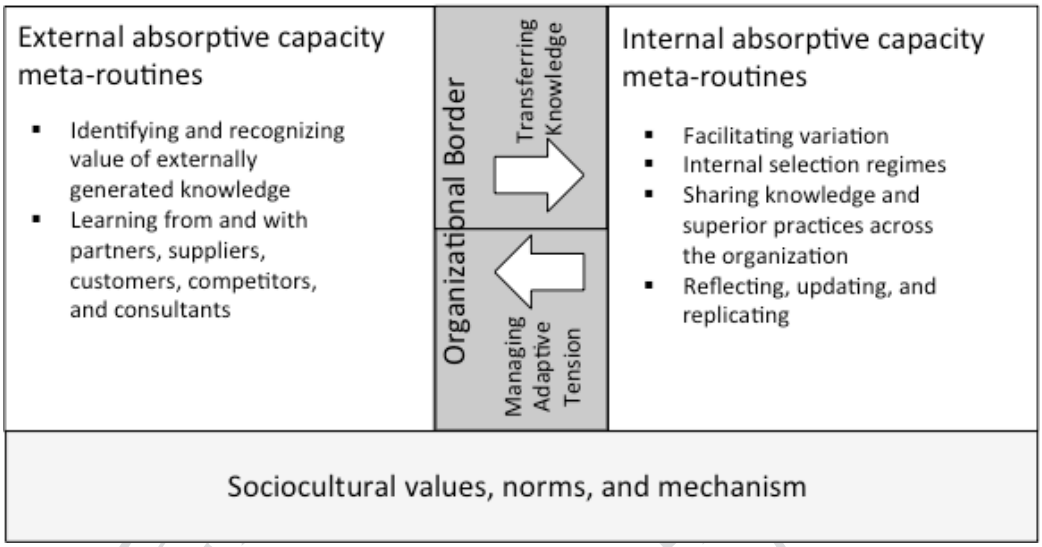


Figure 2.8: Taxonomy of internal and external absorptive capacity meta-routines

Source: Adopted from Lewin et al. (2011) and Peeters et al. (2014)

As proposed by Feldman and Pentland (2003), organizational routines consist of two aspects. The first aspect is the routine structure, which can be referred to as the *ostensive* aspect. The second aspect is the actual performance by the responsible staffs, in a specific time and specific places. This is the *performative* aspect. The structural aspect of routines reflects the retrospective view of handling past problem solving while the performing aspect reacts to the current and future circumstances (Feldman & Pentland, 2003; Salvato & Rerup, 2011). Thus, it can be concluded that routines are designed to yield performance results and to understand this performance. Routines are established for the functional purposes of giving control, minimizing cost, reducing the risk from repeated mistakes, and avoiding conflicts from heterogeneity activities (Nelson & Winter, 2009).

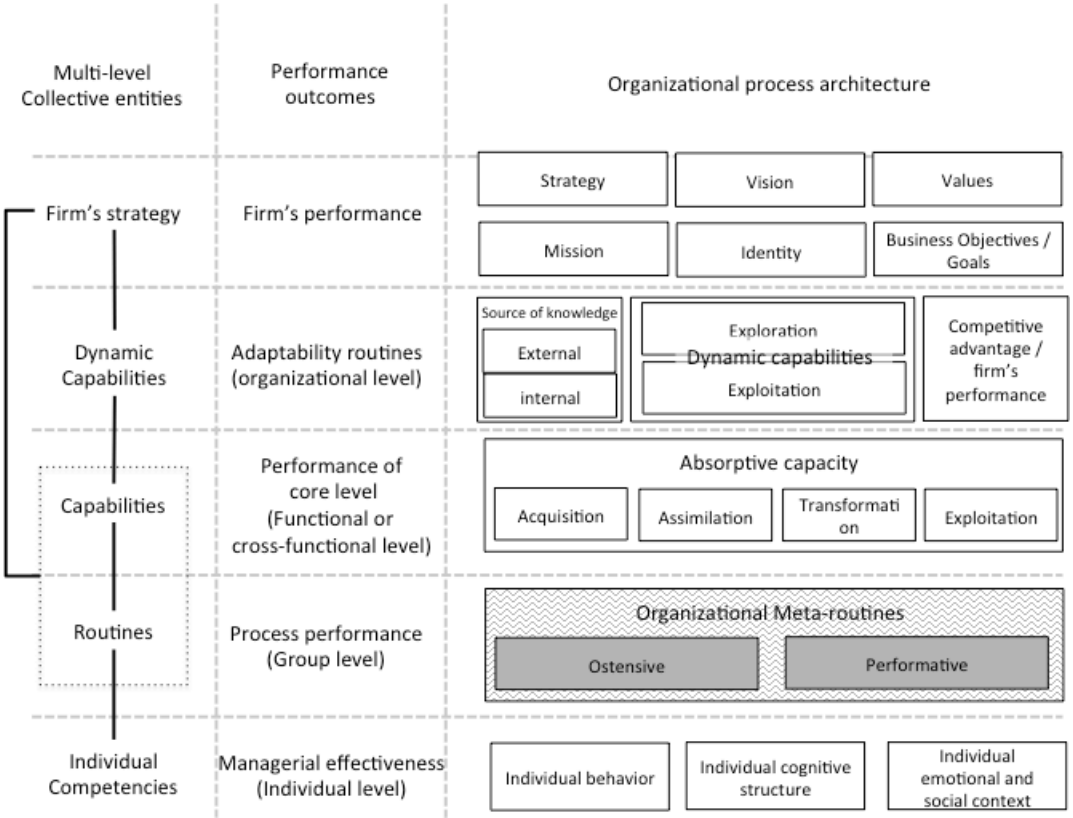


Figure 2.9: Organizational routines and capabilities based on Process Oriented Architecture

Source: Adapted from Boutros and Purdie (2014) and Salvato and Rerup (2011)

Organizational routines are regarded as organizational memory (Lewin et al., 2011; Peeters et al., 2014). They are conceptualized to store knowledge and capabilities and are a key component of organizational learning (March, 1991). Since routines are a structural construct, the type of knowledge stored is rather static, and a great deal of it is codifiable and explicit. However, even in routines that reflect the static parts of organizational knowledge, the component that makes the routines become dynamic is the people who perform the routine (Parmigiani & Howard-Grenville, 2011).

At higher levels of organizational processes, Salvato and Rerup (2011) define organizational capabilities as the collection of routines forming a larger unit that

contains the know-how of the organization to perform expected outcomes. Capabilities are like routines in that when performing routines, organized activities are required, and repetitious. However, capabilities are not necessarily at the level of routines; that is, a capability in a domain of knowledge may insinuate a performance result of the process of achieving that result highly dependent on context and situation, i.e. not routine.

At the lower level of the process and routine model, the performing level starts with the individual. Habits, behaviors, social setting, values, interests, motives, beliefs, and level of knowledge are some of the components that define the ability to perform (Salvato & Rerup, 2011). Competency bridges the gap between individual action and the group level, and then organizational level performance.

From the context of the organizational process and routine model (see Figure 2.9), there is still no clear indication of the relations and linkage between individual-level competencies and firm-level adaptive routines and capabilities, or the linkage between the organizational capabilities and the process and performance capabilities and routines (Salvato & Rerup, 2011).

Taxonomy in the meta-routine model starts externally from organizational absorptive capacity and moves inward to internal absorptive capacity. Meta-routines describe the capabilities underlying management of variation, selection, and replication activities (Lewin et al., 2011). Table 2.13 provides the definition of meta-routines with sample of practices.

Table 2.13: Definition of meta-routines

	Meta-routines	Definitions	Sample of practices
Externality	Identifying and recognizing the value of externally generated knowledge	Identify and recognize the value of external knowledge	• Gatekeepers • Probing • Search, research, survey, and literature review
	Learning from partners, suppliers, customers, competitors, and consultants	Learn from external contributors	• Partners and social relationships • Open sources • Clients' demands
	Transferring knowledge back to organization	Link external knowledge with firm's capabilities	• Firm's knowledge sharing mechanisms
Internality	Facilitating variation	Various processes and norms that facilitate the emergence and exploration of new ideas at different levels of the organization	• Technology and knowledge sharing forum • Technology town hall, brainstorming workshop
	Managing internal selection regimes	Process to select and screen various projects and activities to determine resources to be allocated	• Ideas funnel screening • Proof of Concept, prototypes, exploratory learning
	Sharing knowledge and superior practices across organization	The way organizations practice and share information through formal structures and processes among organizational units	• Roadshows • Change management and transition
	Reflecting, updating, and replicating	Feedback mechanism on applying knowledge to practices	• Review results against objectives • Lessons learned reflective session
	Managing adaptive tension	Comparing and benchmarking with those outside the organization	• Benchmarking • Comparing against goals

Source: Adopted from Lewin et al. (2011)

Peeters et al. (2014) conducted a study based on the framework of absorptive capacity meta-routines over two companies that strategically outsourced their operations. The result interestingly reveals several observable points. First, the organization that has strong top-down managerial support on absorbing and processing of new knowledge can perform absorption more efficiently than the bottom-up approach of getting the knowledge across. Managerial support does not mean command and control, but persuasion based on a shared vision and flexibility in

making local decisions. In search and select activities, the attention of management has higher impact on absorption than a local problemistic search, which is a search in response to a problem (Greve, 2008). The search for external knowledge involves more informal ties from organizational members and partnering parties than from the formal routines conducted on a systematic basis. Finally, for internal efficiency in integrating new knowledge, an organization with a strong culture of sharing is more likely to have higher efficiency in mobilizing knowledge across the organization than an organization with a weaker sharing culture.

2.5 Other related literatures

In this section, additional relevant literature to the research study is presented.

2.5.1 Organizational Structure

According to Van den Bosch, Volberda and de Boer (1999), organizational structure can be classified into three categories: functional form, divisional form, and matrix form. The organization of functional form structure is based on similar function formed together into departments, offering services to other departments based on their functional expertise. The divisional form structure, on the contrary, groups together relevant functions into a department. The aim of divisional form structure is to offer complete competencies in doing a certain project or task that requires multiple disciplinary in the task completion. The matrix form structure bases its organization by the combining of both the functional and divisional formation. It captures the completeness in conducting a task that requires multiple disciplinary, while maintaining the authoritative hierarchy. The strength and weakness of the three forms are listed in table 2.14.

Table 2. 14: Strength and weakness of different organizational formation

Dimension of knowledge absorption	Definition of dimension of knowledge absorption	Organizational form		
		Functional	Divisional	Matrix
Efficiency	Firm's ability to identify, assimilate, and exploit knowledge from a cost and economies of scale perspective.	High	Low	Low
Scope	Variety or breath of knowledge	Low	Low	High
Flexibility	How a firm acquire external knowledge, and reconfiguring existing resource.	Low	High	High

Source: Adapted from Van den Bosch et al. (1999)

Base on the Resource Based View (RVB) of the firm (Eisenhardt & Martin, 2000; Helfat & Peteraf, 2009), functional formation has the highest efficiency in utilizing the resources to deliver result. Grouping of similar disciplinary competencies into one department can deliver the economy of scale, with lower overhead cost, and superior on skills in delivering the result. However, the variety and flexibility in service offering is limited. The functional form structure is quite common in large scale organization, where resources are pooled and organizational management is complex.

Division form structure has a loose control over the hierarchical authority. The formation focuses on flexibility in delivering result. The formation that combines multiple disciplinary competencies together allows faster respond with highest efficacy in reaching the result. However, the divisional structure has weakness in utilizing resources. Comparing to functional form, the resource utilization will not reach the economy of scale. Divisional form is more suitable in high dynamic environment (Van den Bosch et al., 1999).

The matrix form combines the efficiency in resource utilization of functional form and the flexibility in delivering result. The matrix formation retains hierarchy with

multidiscipline of knowledge. The primary objective of matrix form is to offer variety of service offering. It is best for self-sustaining, complete autonomous driven organizational unit.

According to Merok and Brynjulf (2014), departmental autonomy has impact to knowledge absorption. The high autonomy department outperforms the low autonomy on knowledge transfer. This indicates that the group receiving transferred knowledge can deliver better result when the transferee department contains multidisciplinary team with delegation to make decision and self-adjustment. There has been negative relation between the departmental autonomy and absorptive capacity. This means that the learning can have barriers when transferring the same knowledge to other areas within the same organization.

2.5.2 Boundary-Spanning knowledge transfer extent

The extent of knowledge transfer sometimes goes beyond the physical boundary of organization. According to Beckett and Hyland (2011), the external and internal environments have influences on how transition are enacted. Transferring across the boundary involves multiple types of agents. Involving these agents brings complexity as these agents possess different level of languages and understanding. At the crossing point, these agents bring across the knowledge transferring context, adding them with their own personal context, producing interpretive schemas, communication and effective translation of overlapping language. This is to establish the common ground and by using routines, stories, and models, which will help transferring knowledge across the border.

The context of transferring across the border involves both technical and non-technical (commercial) knowledge (Beckett & Hyland, 2011). The context flows

change from vision to concept, from concept to technical details, and from technical details to commercial. The transferring agent bridges the differ contests between the two sides and communicate effectively within the unit, across the working units, and outside the organizations across the knowledge transfer boundary extent. The agent is acting as liaison, translator, brokers, and mediators. These functions of agent are also known as the functions of a gatekeeper.

Rosenkopf and Nerkar (2001) studied the knowledge transfer across boundary by using terminology of local and distance and compare with internal and external physical boundary. The transfer is local when the transfer is within knowledge domain, while it is distance when the knowledge is transferred into a different knowledge domain. The study found that the transfer within the organization has less impact to the utilization of the newly transformed knowledge than the external transfer. The study also found that the externally transferred knowledge will focus on the well-regarded knowledge, while the internal transfer will focus on the same knowledge traits. Thus, external transfer will have impact on the selection of new technological knowledge; while the internal transfer will enhance the existing knowledge.

According to Cranefield and Yoong (2007), the transfer across boundary extent involves special gatekeeper agent. The effectiveness of the transfer will very much rely on the ability of the gatekeeper. The external transfer is much more complicate than the internal across knowledge domain transfer, thus the effectiveness and efficacy of the transfer depends on the ability of the gatekeeper. The utilization of the transformed knowledge depends on the ability of the transferor, the cognitive ability of the knowledge-receiving individual, the background, goals, and beliefs.

2.5.3 Psychological Safety

Psychological safety refers to the perception of individuals who feel comfortable being themselves without fear or negative consequences to self-image, status, or career (Carmeli, Brueller, & Dutton, 2008). Psychological safety is a behavioral factor that has been discussed in previous studies of Thai culture. As confirmed by Cauwelier, Ribière, and Bennet (2016), psychological safety is influenced by the cultural norms that exist in the country where the individual or team members grew up. This negative behavioral symptom appears as fear of expressing oneself in public or fear of using English as the communal language for knowledge transfer. Psychological safety is associated with the learning efficiency in the organization (Edmondson, 1999) and work engagement (Edmondson, 2014).

2.6 Systematic Review and Analysis

In the previous section, I summarized the major contributions in the absorptive capacity debate taking a chronological approach.

This section takes a systematic approach and summarizes absorptive capacity contributions from an analytical perspective including pattern analysis, cross-referencing pattern analysis, and detailed descriptions of internal absorptive capacity capabilities. This review adds to the previous sections where I take a chronological approach to review absorptive capacity developments and reconceptualizations proposed between 1990 and 2015 years and, therefore, it provides a comprehensive view of the phenomenon studied.

In this section, I reviewed 189 retrieved documents from a referential space of 25 years of researches. A pattern analysis of how absorptive capacity has been researched in the literature is conducted. The analysis will be done in three parts. The

first part looks at general patterns of research. The second part regards cross-referencing patterns between two variables. The third part focuses on internal absorptive capacity capabilities.

I used a spreadsheet to construct the database of the reviewed literature and used the Pivot Table function to analyze the characteristics of these research articles. The main calculation function of the pivot table was the counting of occurrences.

2.6.1 Systematic literature review and research patterns

Use of Conceptual Reference: This analysis regards the use of absorptive capacity in research studies. From Table 2.15 and Figure 2.10, the major use of absorptive capacity refers to minor citations (72 articles).

The second highest use of absorptive capacity regards the inclusion of the construct in a research model (40 articles) in terms of hypotheses or propositions.

The third highest referential use of absorptive capacity regards its implementation as a theoretical support or within a research model (23 articles).

Another important referential use of absorptive capacity relates to its use as a theoretical base for a paper (11 articles). The use of the construct in this category is the strongest, and allows the development of new theory based on the absorptive capacity construct.

The use of the absorptive capacity construct is mentioned under different meanings (31 articles) or refers to something else that is irrelevant to the construct (12 articles). Under this category, absorptive capacity results misinterpreted for what the construct was originally intended.

Table 2.15: Use of References (Conceptualization)

Use of References (Conceptualization)	**Total**	**%**
Referenced as minor citation	72	38
Provided theoretical support	23	12
Used in hypotheses, proposition, or model	40	21
Formed a theoretical base for paper	11	6
Did not refer to absorptive capacity but study related to absorptive capacity	31	17
Irrelevant to absorptive capacity	12	6
Grand Total	**189**	**100**

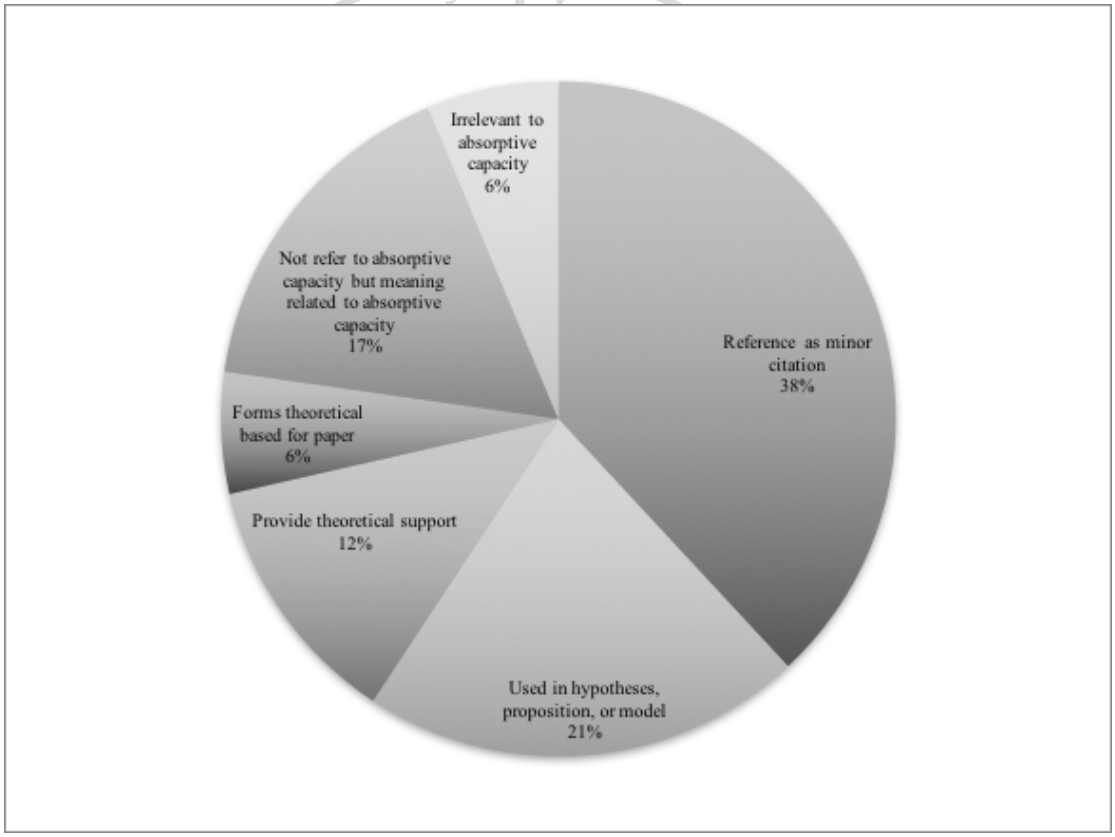


Figure 2.10: Illustration of the use of references (Conceptualization)

Absorptive capacity referential model: This reviewed aspect identifies which conceptualization and related models were used in the articles. Most articles used absorptive capacity as a "black box" in their studies (80 articles). The focus was on the construct itself and its relation to the variables introduced in the specific study.

This group of articles does not provide details or even base their reference on a specific conceptualization (see Table 2.16 and Figure 2.11).

Table 2.16: Absorptive capacity referential model

Absorptive Capacity Referential Model	**Total**	**%**
Absorptive capacity itself	80	42
Cohen and Levinthal (1990)	27	14
Zahra and George (2002)	26	14
Todorova and Durisin (2007)	4	2
Mixed use of the models	5	3
Reify use of construct	5	3
Not explicitly called absorptive capacity	42	22
Grand Total	**189**	**100**

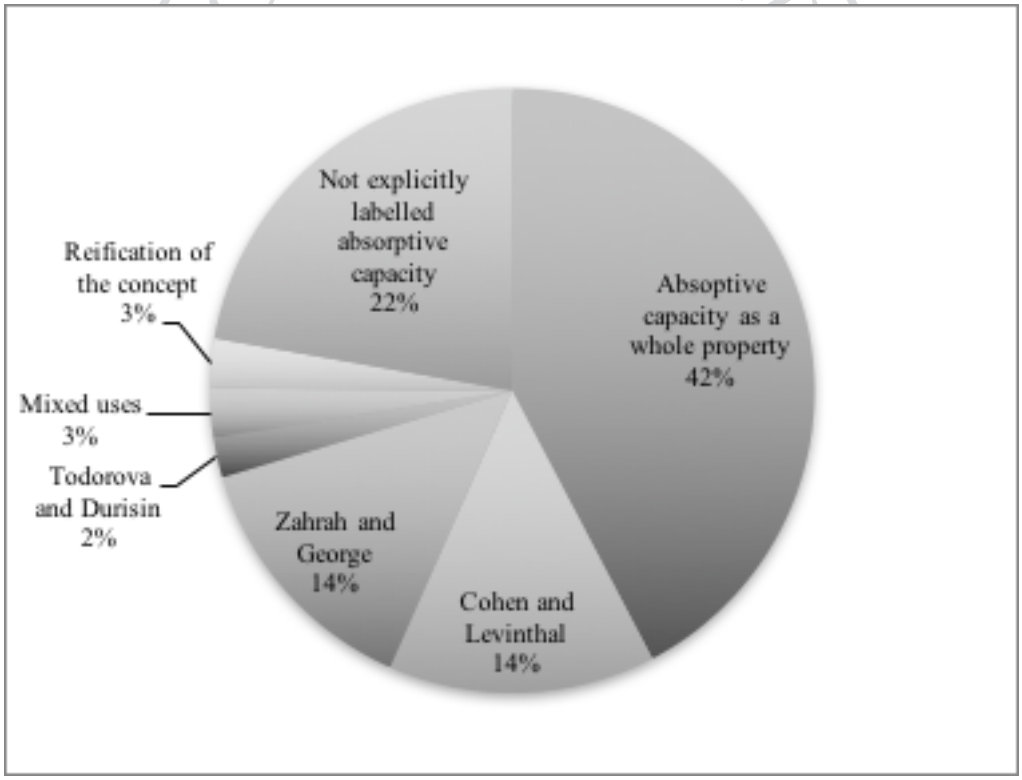


Figure 2.11: Display of Absorptive capacity referential model

There are 57 articles that based their studies on one of the three major constructs. Out of these, 27 articles (47.3%) refer to the original construct of Cohen and Levinthal (1990), 26 (45.6%) refer to the reconceptualization by Zahra and George

(2002), leaving only 4 (7.1%) using the latest reconceptualization by Todorova and Durisin (2007). Table 2.18 additionally refers to the mixed use of the model and the reification of the construct. Mixed use of the models refers to the cohesive use of more than one of the three referential models in the research studies. Reification is "the outcome of the process by which we forget the authorship of ideas and theories, objectify them (turn them into things), and then forget that we have done so" (Lane et al., 2006, p. 835). Reification can be problematic as some researchers may have ignored the original assumptions of the concept or construct, treating it as a general purpose entity to solve some problems (Lane et al., 2006). There are only ten articles classified in these two categories.

The level of analysis: This category determines the level of organizational units analyzed in the studies I reviewed (see Table 2.17 and Figure 2.12). The intention of the original construct indicates that absorptive capacity is a property at the organizational level. However, from the review I conducted, several studies treat absorptive capacity at different levels. Despite the majority of these studies covering performance as an organization level property (83 articles), there is the emergence of treating absorptive capacity as a property at the individual level (22 articles) and at the team level (17 articles).

Table 2.17: Level of analysis

Count of Level of analysis	Total	%
Group/Team	17	9
Individual	22	12
Inter-Organizational	31	16
Organizational	83	44
Not explicit	30	16
Mixed use of Multi-level	6	3
Grand Total	**189**	**100**

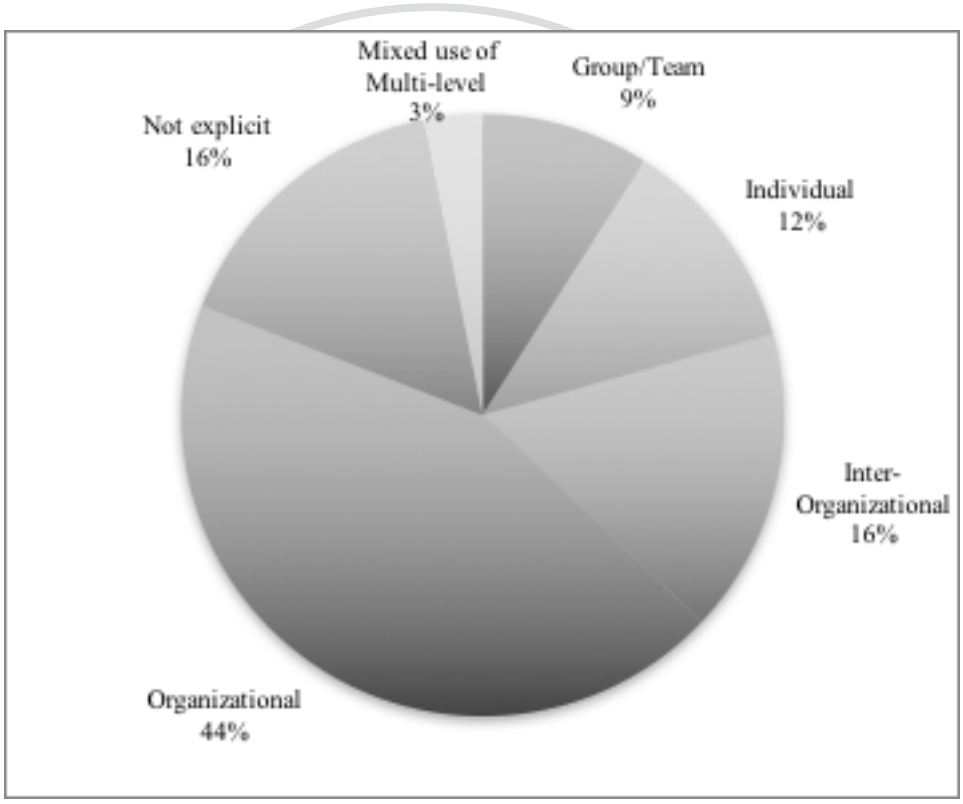


Figure 2.12: Display of level of analysis

Additionally, absorptive capacity is studied at the internal organizational level, as well as at the inter-firm level (31 articles). Furthermore, some studies are conducted at multiple levels (6 articles); and some studies do not explicitly address the level of analysis (30 articles).

Publishing journals: Table 2.18 indicates the academic journals that have published most in the absorptive capacity domain. When listing the name of journals that publish articles regarding absorptive capacity (>1 article), the total count reaches 28 journals.

Table 2.18: Journals that published research studies on absorptive capacity (>1 article)

Journals	**Total**
Strategic Management Journal	14
Research Policy	7
Academy of Management Journal	5
Management Decision	5
MIS Quarterly	5
Organization Science	5
R&D Management	5
The Learning Organization	5
European Management Journal	4
Journal of Management Studies	4
Knowledge and Process Management	4
British Journal of Management	3
Industrial Marketing Management	3
International Journal of Management Reviews	3

Journals	**Total**
Journal of Management	3
Management Science	3
Industrial Research Institute	2
Information & Management	2
International Business Review	2
International Journal of Information Management	2
International Journal of Innovation Management	2
International Journal of Production Research	2
Journal of International Management	2
Journal of Management Information Systems	2
Project Management Journal	2
Technovation	2
The Journal of Product Innovation Management	2
The Service Industries Journal	2
Total of Top Listed Articles	**102**

The *Strategic Management Journal* ranks at the top of the list with 14 total published articles. The *Strategic Management Journal* publishes high-quality research on strategic management (Wiley Online, n.d.). This implies that absorptive capacity is viewed as a highly-appreciated construct within the strategic management communities of scholars and peer-reviewing members.

When comparing journals with those that were reviewed by Lane et al. (2006), Mariano & Walter (2015), Roberts et al. (2012), Serenko and Bontis (2009), I find that the listing of the most published articles in my articles set conforms to the list of published reviews and top knowledge management referenced journals.

The linkage of research on absorptive capacity with other concepts: This analysis is performed with the use of thematic analysis (Boyatzis, 1998). First, the research linkage between absorptive capacity and other concepts is listed, and second, their recurrence is counted, reviewed, and grouped together according to their relevancy (see Table 2.19 and Figure 2.13).

Table 2.19: Research of absorptive capacity and linkages to other relevant research concepts

Count of Relevant Concept	**Total**	**%**
Knowledge Transfer	34	18
Social Relationships	26	14
Innovation	20	11
Strategic Management	17	9
Absorptive capacity	14	7
Knowledge Type	11	6
Dynamic Capabilities	10	5
Organizational Learning	10	5
IT	9	5
N/A	8	4
Knowledge Creation	5	3
Knowledge Spillover	5	3
Knowledge Transfer Barrier	3	2
Project Management	3	2
Ambidexterity	2	1
Behavioral factors	2	1
Combinative Capabilities	2	1
Leadership	2	1
Agent Role	1	1
Knowledge Complexity	1	1

(Continued)

Table 2.19 (Continued): Research of absorptive capacity and linkages to other relevant research concepts

Count of Relevant Concept	Total	%
Knowledge Management Practice	1	1
Knowledge Source	1	1
Measurement	1	1
Routines	1	1
Total	**189**	**100**

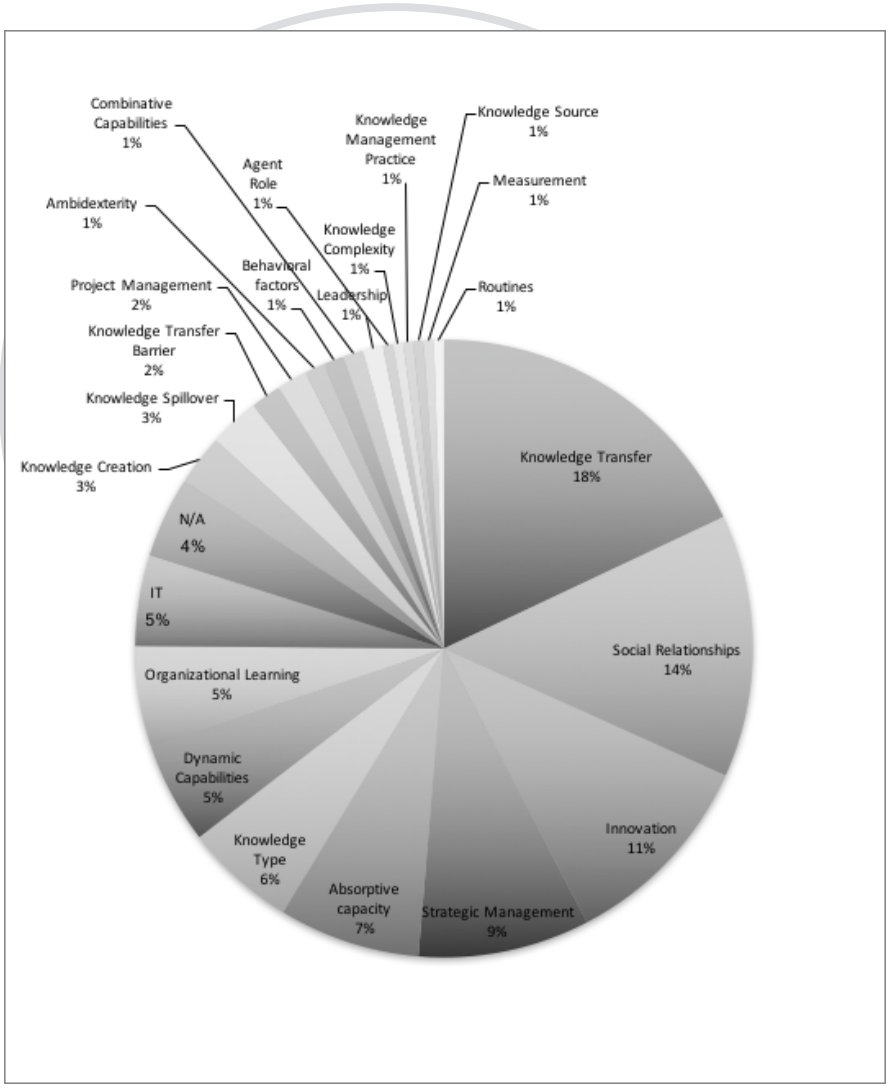


Figure 2.13: Display of linkages of absorptive capacity to other relevant research concepts

As shown in Table 2.19, there are only 14 articles focusing on absorptive capacity itself, e.g., measuring absorptive capacity values (Daspit & Souza, 2013; Flatten et al., 2011). However, as can be seen from the list, research has been conducted linking absorptive capacity with other theoretical concepts. Hence, we can conclude that current research is moving toward the combination of absorptive capacity to other related concepts.

Knowledge transfer represents the major research area in more recent studies. Many researchers are focusing on the inter-firm knowledge transfer among business partners, e.g., expatriate competencies as a necessary factor for efficient knowledge transfer from the parent company to subsidiaries (Chang & Peng, 2012). Some research is looking at the impacting factors or moderating variables of the construct, e.g., how organizational antecedents affect PACAP (Potential Absorptive Capacity) and RACAP (Realized Absorptive Capacity) (Jansen et al., 2005). Note that according to Zahra and George (2002), PACAP is the capabilities of a firm to acquire and assimilate external knowledge, and RACAP is the capabilities to transform and exploit newly generate knowledge. Others are investigating social relationships, e.g., social capital in key customer knowledge absorption relationships (Yli-Renko et al., 2001).

Following closely is the area of innovation connected to absorptive capacity, linkage to innovation is gaining important ground. Absorptive capacity has been proven to support organizational innovation and innovation capacity (Carlo et al., 2012; Cepeda-Carrion et al., 2012; Li et al., 2011). There are arguments regarding the measurement of innovation. The original construct used R&D spending as the proxy to measure performance (Cohen & Levinthal, 1989). Many researchers used the

earning from marketing innovative products as the measure (Caragliu & Del Bo, 2011; Fosfuri & Tribó, 2008; Lewin et al., 2011), customer value enhancement (Berghman et al., 2013), or other means of impact factors to determine the success of firm innovativeness (Cepeda-Carrion et al., 2012; Li et al., 2011). However, research on how to measure the firm's performance is still evolving (Fernhaber & Patel, 2012; Fosfuri & Tribó, 2008).

2.6.2 Cross-referential research patterns analysis

In this section, I combine multiple variables of meta-data from my systematic literature database to investigate some of the key relationships among the research studies I retrieved and reviewed.

How the construct is used in the research stream. Predictably, Cohen and Levinthal's (1990) seminal contribution to the absorptive capacity debate has the highest influence on current research (see Table 2.21). While most studies refer to it as a minor citation, there are quite a number of other studies that use the construct for theoretical support (10 articles). This means that Cohen and Levinthal's (1990) seminal work highly contributes to other related theorizations.

Zahra and George's (2002) reconceptualization brings important challenges in research studies on absorptive capacity, regarding to conceptual and theoretical models used in these reviewed articles. For example, there have been several research studies on antecedent, moderating, and outcome factors based on Zahra and George's (2002) ACAP model (see Camisón & Forés, 2011; Cepeda-Carrion et al., 2012; Fosfuri & Tribó, 2008; Melkas et al., 2010); some others have focused on the inter-relations between PACAP and RACAP (Garner, 2007; Yeoh, 2008), some others on the measurement unit of ACAP (Flatten et al., 2011); and a group of articles have

focused on organization strategy and impact on PACAP and RACAP (e.g., Vega-jurado et al., 2008).

Out of this entire set of studies, only four studies have based their core research model or theory on the construct by Todorova and Durisin (2007). Two of these studies use their construct in the research model (Daspit & Souza, 2013; Enkel & Heil, 2014); and two of them use it to build new theory (Gebauer et al., 2012; Roberts et al., 2012). All four articles use Todorova and Durisin (2007) conceptualization because of the best fit of the construct with the phenomenon studied.

Level of analysis and absorptive capacity properties. As previously introduced, there have been dispute arguments on whether absorptive capacity should be treated as capabilities, organizational resources, or both. When cross-referencing with the level of analysis, most of the researchers who see absorptive capacity as the capabilities see the unit of analysis at the organizational level (e.g. Fernhaber & Patel, 2012; Melkas et al., 2010; Robertson et al., 2012). Many of the researchers that base their studies on dynamic capabilities see it as a resource (e.g. Culpan, 2008; Dibbern, Winkler, & Heinzl, 2008). Some of them start to realize that absorptive capacity has dual status as both capabilities and as a resource (e.g. Andersén & Kask, 2012; Camisón & Forés, 2011; Gebauer et al., 2012).

Level of analysis and absorptive capacity construct. Another aspect of absorptive capacity is whether it is the property of the firm level, or it should be addressed at the group or individual level. The original construct treats it as firm-level capabilities. As it can be clearly seen from Table 2.22, the researchers who based their research study on Cohen and Levinthal's (1990)work see the construct as capabilities. However,

there are increasing numbers of researchers that consider Cohen and Levinthal's (1990) construct as organizational resources.

An interesting finding related to the use of Zahra and George's (2002) conceptualization regards its treatment as a capabilities property, as well as a dual property. An important note is that Zahra and George (2002) base their study on dynamic capabilities.

Research on absorptive capacity over the years. When looking at the distribution of research between the first publication in 1990 until the end of 2014, I found that the first article citing absorptive capacity goes back to 1994, four years after the first publication of the seminal construct (see Table 2.21). No articles were published in 1995 while an exponential number of research studies on absorptive capacity touches two digits in 2006 and has remained high ever since.

An interesting fact regards the use of Cohen and Levinthal's (1990) original construct which still outnumbers Zahra and George's (2002) construct in terms of numbers of research studies by the ratio of 27 to 26. Considering 2002 as the year that Zahra and George re-conceptualize Cohen and Levinthal's (1990) model, I find that the ratio of the research before 2002 and after 2002 is 16 to 173. That is far greater for the works in the last 12 years than the first 12 years. This implies that the work of Zahra and George (2002) has drawn attention from researchers to look at the construct and has offered insights for future research.

Table 2.20: Absorptive capacity conceptualizations and their use in the current domain

Absorptive capacity construct	Reference as minor citation	Used in hypotheses, proposition, or model	Forms theoretical based for paper	Provide theoretical support	Not refer to ACAP but meaning related to ACAP	Irrelevant to ACAP	Grand Total
Cohen and Levinthal (1990)	13	2	2	10			27
Zahra and George (2002)	1	15	6	4			26
Todorova and Durisin (2007)		2	2				4
						Sub Total	57
Mixed use of the models	2	2	1				5
Absorptive capacity as whole property	53	16		9	1	1	80
Reify use of Concept	2	3					5
Not explicitly called absorptive capacity	1				30	11	42
						Sub Total	132
Grand Total	**72**	**40**	**11**	**23**	**31**	**12**	**189**

Table 2.21: Level of analysis and absorptive capacity property

Level of analysis	**Absorptive capacity property**				
	Capabilities	**Dual Properties**	**Resource/Asset**	**Not explicit**	**Grand Total**
Organizational	26	9	14	34	83
Group/Team	6	1	6	4	17
Individual	4		5	13	22
Inter-Organizational	6	3	8	14	31
Mixed use of Multi-level	2	1		3	6
Not explicit		2	3	25	30
Grand Total	**44**	**16**	**36**	**93**	**189**

Table 2.22: Level of analysis and absorptive capacity construct

Absorptive capacity construct	**Absorptive capacity property**				
	Capabilities	**Dual Properties**	**Resource/Asset**	**Not explicit**	**Grand Total**
Cohen and Levinthal	9	2	7	9	27
Zahra and George	14	6	3	3	26
Todorova and Durisin	1	2	1		4
				Sub Total	57
Mixed use of the models	1	1	2	1	5
Absorptive capacity as whole property	14	3	16	47	80
Not explicitly called ACAP	4	1	4	33	42
Reify use of Concept	1	1	3		5
				Sub Total	132
Grand Total	**44**	**16**	**36**	**93**	**189**

Table 2.23: Research on absorptive capacity 1990 – 2014

Absorptive capacity construct	**Year**																					**Grand Total**
	1992	**1994**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Cohen and Levinthal			2	1	1	1		3			1	2	1	1	4		1	4	3		1	1	27
Zahra and George										2		2			5	1	4	2	6	1	3		26
Todorova and Durisin																			2	1	1		4
																					Sub Total		57
Absorptive capacity as whole property		1				1	1	1	3	2	2	2	5	7	6	6	7	13	5	12	6		80
Mixed use of the models																1		1	3				5
Not explicitly called absorptive capacity	1					1	1	1		4	2		4	3	4	9	1	6	2	2	1		42
Reify use of Concept								1				1							1	2			5
																					Sub Total		132
Grand Total	**1**	**1**	**2**	**1**	**1**	**3**	**2**	**6**	**3**	**8**	**5**	**7**	**10**	**11**	**19**	**17**	**13**	**26**	**22**	**18**	**12**	**1**	**189**

Zahra and George's (2002) contribution has been described as the best fit to support the formation of theory (Fosfuri & Tribó, 2008; Jansen et al., 2005; Roxas, 2008) or to provide a more comprehensive understanding of the construct in relation to organizational performance (Camisón & Forés, 2011; Vega-jurado et al., 2008).

The ratio of 1.13 papers per year (27 studies over 24 years) indicates that Cohen and Levinthal's (1990) construct is still being used as the original construct and still has a high degree of centrality, that is, the idea is accepted to be used for further research. Zahra and George's (2002) construct is also widely used. This means that Zarah and George's (2002) work has inspired many researchers and has stimulated research in this area. The referential index during the past 14 years of Zahra and George's (2002) construct is 2.17 papers per year (26 studies over 12 years), double that of Cohen and Levinthal's (1990) construct. Todorova and Durisin's (2007) construct is evolving slowly with the reference ratio of 0.57 (4 studies over 7 years).

2.6.3 Research on absorptive capacity internal capabilities and linkage to meta-routines

Todorova and Durisin's (2007) conceptualization of absorptive capacity will be used as the referring construct in this research study. A crucial reason for selecting this latest conceptualization is based on the fact that it takes into consideration the recent evolution of the construct while still preserving the original ideas and definitions developed in the seminal work by Cohen and Levinthal (1990). Another important reason regards the introduction of a feedback loop into the construct that makes the treatment of absorptive capacity as a dynamic and evolving process in a turbulent and ever-changing external environment. The level of analysis of this study will regard absorptive capacity meta-routines and, in order to combine the absorptive

capacity internal capabilities as conceptualized by Todorova and Durisin (2007) with the work of Lewin et al. (2011) on meta-routines, I will map and relate both constructs to each others.

I use the definition of internal capabilities given by Zara and George (2002) as the base of references. This is because Todorova and Durisin's (2007) construct also refers to the definition given by Zahra and George (2002). This definition is reported in table 2.9 of this document. To map and combine, several keywords are examined and compared to identify the relationship between absorptive capacity internal capabilities and meta-routines (see figure 2.14 and details in table 2.24).

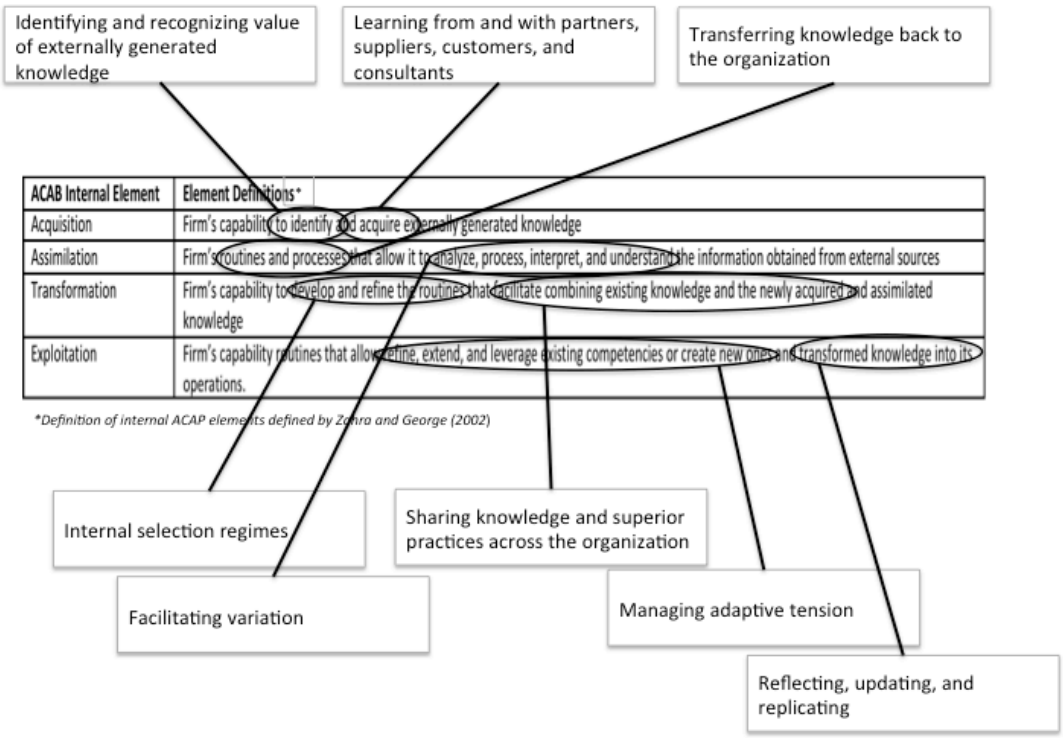


Figure 2.14: Mapping of absorptive capacity internal capabilities and meta-routines internal elements

Table 2.24: Mapping of Lewin et al.'s (2011) meta-routines and Todorova and Durisin's (2007) internal capabilities of absorptive capacity

	Meta-routines internal elements	**Internal capabilities of absorptive capacity**
Externality	Identifying and recognizing the value externally generated knowledge	Identification
	Learn from partners, suppliers, customers, competitors, and consultants	Acquisition
	Transferring knowledge back to organization	Assimilation
Internality	Facilitating Variation	Assimilation
	Internal selection regimes	Transformation
	Sharing knowledge and practices across organization	Transformation
	Reflecting, updating, and replicating	Exploitation
	Managing Adaptive tension	Exploitation

A further step in my analysis regards the in-depth review of the absorptive capacity internal capabilities, meta-routines and exploratory regimes as summarized in Table 2.25.

Table 2.25: Absorptive capacity internal capabilities, meta-routines, and exploratory regimes: Identification capability

Meta-routines	Exploratory Regimes			
	Agent Roles	**Behavioral Factors**	**Impact Factors**	**Processes & Routines**
Identifying and recognizing the value of externally generated knowledge	▪ Gatekeeper as the border gateway (Fernhaber & Patel, 2012; Cranefield & Yoong, 2007) ▪ Triggering occurs when one member of the network introduces important or new knowledge to the organization (Tang, 2011) ▪ Identifying new applications for products is an intuitive process requiring firm's and customer's absorptive capacity (Koruna, 2003) ▪ Wide search and extended scope beyond industry is the responsibility of staffs (Flatten et al., 2011).	▪ Intuition and interpretation of individuals and groups (Sun & Anderson, 2010) ▪ Incentives drive the need for new knowledge (Schmidt, 2010)	▪ Customer needs, industrial tendencies, environmental factors, cross-industry threats (Berghman et al., 2013), ▪ R&D Cooperation; Experience with knowledge search (Fosfuri & Tribó, 2008), ▪ Strategic impact urgency (Lewin et al., 2011); Knowledge sourcing strategy (Lee et al., 2010) ▪ Joint decision making, and inter-organizational process modularity (Malhotra et al., 2005), ▪ Complementarity and social relationship between firms (Andersén, 2012; Sherif et al., 2012), ▪ Key customer needs (Yli-Renko et al., 2001) ▪ Knowledge comes from many sources (Peeters et al., 2014)	▪ Screening involvement impacts efficiency in new knowledge identification (Schmidt, 2010) ▪ "Knowledge Scanning" is the internal capability of top management (Ali et al., 2012)

(Continued)

Table 2.25 (Continued): Absorptive capacity internal capabilities, meta-routines, and exploratory regimes: Acquisition capability

Meta-routines	Exploratory Regimes			
	Agent Roles	**Behavioral Factors**	**Impact Factors**	**Processes & Routines**
Learning from and with partners, suppliers, customers, and consultants	▪ Use of appropriate concepts and less complicated language to ease understanding (Melkas et al., 2010) ▪ Collaborators, customers, suppliers, universities, and public support agencies provide effective knowledge transfer (Branzei & Vertinsky, 2006)	▪ Trust between partners, cultural compatibility, prior knowledge, relatedness of business (Lane et al., 2001)	▪ Coordination and social relationships (Jansen et al., 2005; Lichtenthaler, 2009; Park, 2011; Roxas, 2008) ▪ Relationship with research institution (Camisón & Forés, 2011) ▪ Common knowledge relatedness, knowledge diversity and depth determine efficiency of acquisition (Yeoh, 2008; Lane & Lubatkin, 1998; Wang et al., 2010), ▪ Accessibility (Roberts et al., 2012) ▪ Management support is crucial (Flatten et al., 2011)	▪ Proposal of new design (Abecassis-Moedas & Mahmoud-Jouini, 2008) ▪ Facilitated through group learning (Sheu & Wong, 2006)

(Continued)

Table 2.25 (Continued): Absorptive capacity internal capabilities, meta-routines, and exploratory regimes: Assimilation capability

Meta-routines	Exploratory Regimes			
	Agent Roles	**Behavioral Factors**	**Impact Factors**	**Processes & Routines**
Transferring knowledge back to the organization	▪ Interpretation at group level (Sun & Anderson, 2010) ▪ Language barrier prevents efficiency of knowledge transfer (Cranefield & Yoong, 2007)	▪ Not-Invented-Here (NIH: refusal of foreign knowledge) & Buy-In (strong focus on external knowledge acquisition) syndrome (Lichtenthaler & Ernst, 2009) ▪ Common interest across organization (Alin et al., 2011),	▪ Socialization has strong impact on assimilation (Jansen et al., 2005) ▪ Existing knowledge level, knowledge diversity and depth (Camisón & Forés, 2011), ▪ International Joint Venture (IJV) flexibility and adaptability, managerial support, goals, specialized capabilities (Lane et al., 2001) ▪ Partner's interface-directed information (Malhotra et al., 2005)	▪ Feedback routines (Lewin et al., 2011) ▪ Reflection on customers, markets, marketing and sales approach (Berghman et al., 2013) ▪ Communicate across organization with management support and regular meetings (Flatten et al., 2011)
Facilitating variation	▪ Translator as language interpreter and subject matter (Cranefield & Yoong, 2007)	▪ Learning process involves socio-psychological process of interpretation at group-level (Sun & Anderson, 2010)	▪ Risk of being taken over by partners (Andersén, 2012) ▪ Individual knowledge structure, firm's tacit and specific knowledge, cognitive social capital (Lane & Lubatkin, 1998) ▪ Cognitive capital structure (Sherif et al., 2012)	▪ Communication between designer, manufacturer on production process, marketing and sales on new product knowledge to create shared vision (Abecassis-Moedas & Mahmoud-Jouini, 2008) ▪ Internal sharing channel helps on assimilating knowledge across boundary within the firm (Peeters et al., 2014)

(Continued)

Table 2.25 (Continued): Absorptive capacity internal capabilities, meta-routines, and exploratory regimes: Transformation capability

Meta-routines	Exploratory Regimes			
	Agent Roles	**Behavioral Factors**	**Impact Factors**	**Processes & Routines**
Internal selection regimes	▪ Gatekeeper performs sharing of knowledge, championing adoption, translates and interprets context (Cranefield & Yoong, 2007) ▪ Mechanism to use existing knowledge and apply to current work exists (Flatten et al., 2011).	▪ All-Stored-Here (Knowledge generated internally is to be used inside the firm) and Related-Out (Strong reliance on external in-sourcing, omit building own capabilities) syndrome, interpreted at group level (Lichtenthaler & Ernst, 2006)	▪ Prior knowledge, and integration into existing structure (Lichtenthaler 2009; Carlo et al., 2012) ▪ Interdependency of the partnering firms (Andersén, 2012)	▪ Two steps— Make explicit areas of dependence and specialization in knowledge; Identify appropriate interactions (Carlile & Rebentisch, 2003) ▪ A cyclical process of discovery, summary, translation, integration, and evaluation (Bonis et al., 2007)
Sharing knowledge and superior practices across the organization	▪ Lack of empowerment causes actor activities to slow or stop (Melkas et al., 2010)	▪ Managerial encouragement and experimentation on the shared understanding of newly acquired knowledge (Sun & Anderson, 2010)	▪ Social relationship (Sherif et al. 2012; Jansen et al., 2005) ▪ Organizational configuration (Lewin et al., 2011) ▪ New product development requires know-how from different areas (Branzei & Vertinsky, 2006)	▪ Added, deleted, re-interpreted knowledge in different context (Fosfuri & Tribó, 2008) ▪ Communication between idea generator and product development (Abecassis-Moedas & Mahmoud-Jouini, 2008)

(Continued)

Table 2.25 (Continued): Absorptive capacity internal capabilities, meta-routines, and exploratory regimes: Exploitation capability

Meta-routines			Exploratory Regimes	
	Agent Roles	**Behavioral Factors**	**Impact Factors**	**Processes & Routines**
Reflecting, updating, and replicating	▪ Participation of foreign experts and provisional training (Ghauri & Park, 2012) ▪ Management supports the development of prototype (Flatten et al., 2011)	▪ Only-Used-Here (Incomplete or underutilization of existing knowledge due to fear of strengthening competitors) and Sell-Out (overvaluation of external exploitation potential and undervaluation of consequences for internal knowledge exploitation) syndrome (Lichtenthaler & Ernst, 2006) ▪ Behavior and output controls (Li et al., 2010)	▪ Social relationship (Yeoh, 2008; Yli-Renko et al., 2001) ▪ Experiment and feedback about cause and effect (Carlo et al., 2012) ▪ Breadth of quality, privilege, and coordination of information exchange (Malhotra et al., 2005) ▪ Formalization of work procedures and routines (Li et al., 2010) ▪ Effective exploitation associated with efficiency, flexibility, and scope of knowledge (Van den Bosch et al., 1999)	▪ Creation of new products, systems, process, or organizational forms (Fosfuri & Tribó, 2008) ▪ Refine, extend and leverage existing competencies (Melkas et al., 2010)

(Continued)

Table 2.25 (Continued): Absorptive capacity internal capabilities, meta-routines, and exploratory regimes: Exploitation capability

Meta-routines			Exploratory Regimes	
	Agent Roles	**Behavioral Factors**	**Impact Factors**	**Processes & Routines**
Managing adaptive tension	▪ Gatekeeper plays the role, leaving communication to internal relations (Cranefield & Yoong, 2007) ▪ Familiar partners help to exploit knowledge efficiently (Tzabbar, Aharonson, & Amburgey, 2013)	▪ Reward and recognition, effective allocation of resources, effective restructuring of organizational memory (Sun & Anderson, 2010)	▪ Organizational formalization (Jansen et al., 2005) and contractual obligation (Schmidt, 2010) ▪ Structure; skills, competencies, and handling processes (Berghman et al., 2013) ▪ International Joint Venture (IJV) Strategy, training competence; experience (Lane et al., 2001; Camisón & Forés, 2011) ▪ Level of education for technical knowledge, contractual obligation for managerial knowledge (Schmidt, 2010) ▪ Productivity of employee, asset improving and refining capabilities, technical standardization, re-utilization, and cost reduction (Lee et al., 2010)	▪ Integrative capacity (Roberts et al., 2012) ▪ Knowledge sharing routines with external partners must be practiced (Peeters et al., 2014). ▪ Firm focusing on product differentiation tend to be more successful in commercializing product innovation (Branzei & Vertinsky, 2006)

Upon exploring the factors that have an impact on each capability of absorptive capacity, these factors are classified into four groups using a thematic analysis approach (Boyatzis, 1998). I call the group of these factors, the “exploratory regimes”. These exploratory regimes factors are: (1) Agent Role: the role and responsibility of human capital involved in the process of knowledge absorption. These roles can be gatekeeper, liaison, facilitator or translator (Cranefield & Yoong, 2007); (2) Behavioral Factors: socio-psychological factors that impact the human capital in processing the newly acquired knowledge. This includes all psychological factors that impact the behavioral aspects that enhance knowledge transfer, such as social relationship, and other incentives that impact the transfer of knowledge (Feldman & Pentland, 2003); (3) Impact Factors: the antecedents and moderating environmental variables that impact the development of new knowledge. This includes the managerial factors that impact the undertaking of newly generated knowledge, such as leadership and managerial support, organizational structure and restructuring, strategy, empowerment, shared vision, and risks (Bennet & Bennet, 2004; Khoja & Maranville, 2010; Lee, Hyejung, & Jun-Gi, 2014; Mowery, Oxley, & Silverman, 1996).; and (4) Processes and Routines: the procedure for handling the absorption of new knowledge (Lewin et al., 2011; Peeters et al., 2014; Salvato & Rerup, 2011)(see Figure 2.15 for details).

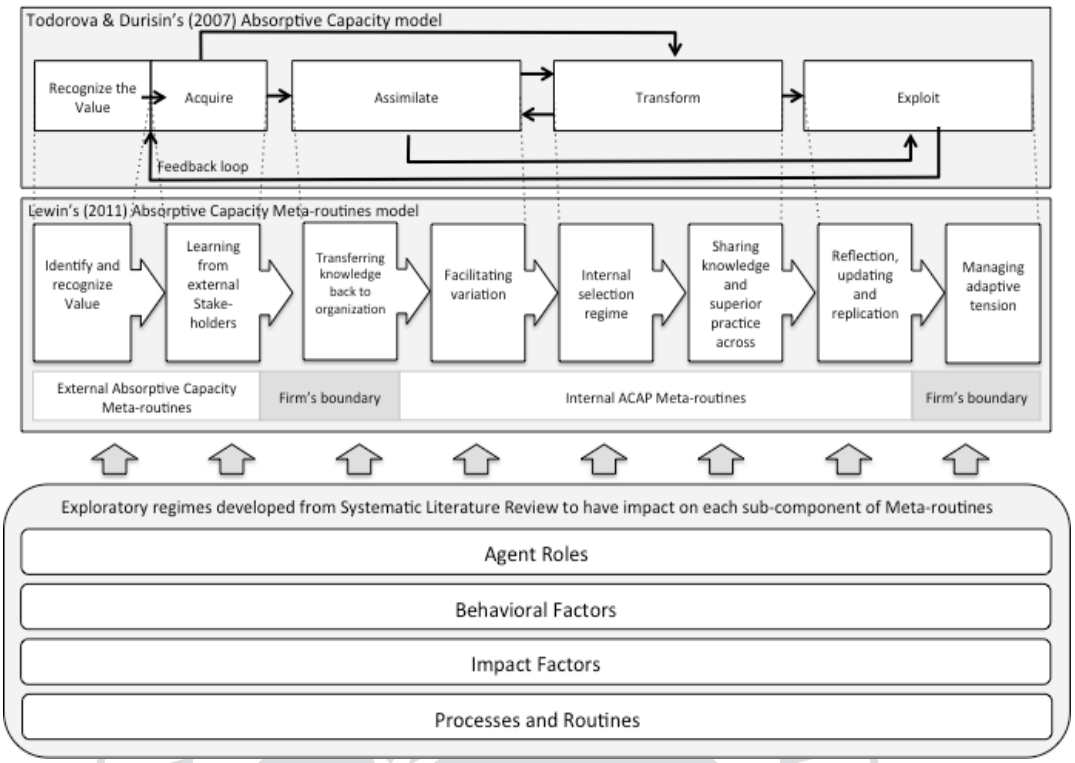


Figure 2.15: Absorptive capacity, Meta-routines, and Exploratory regime framework

Linked together with the support of the Exploratory Regimes, the components of the absorptive capacity construct can represent a fruitful guideline for future empirical explorations of the internal dynamics of absorptive capacity. These exploratory regimes will be used as the guiding framework when exploring the mechanisms of how knowledge is absorbed into an organization and how it can be utilized to realize the firm's commercial benefits.

2.7 IT SMEs

This research study will focus on IT SMEs in Thailand. Therefore it is appropriate and useful to provide related definitions and supporting references.

2.7.1 Characteristics of IT SMEs

The Office of Small and Medium Enterprise Promotion (2007) indicated that a common characteristic of SMEs in Thailand regards their lack of competitive edge. This is due to the following internal factors: weak production and management structures, the lack of marketing capabilities, low on product and service development, low labor quality, inefficient use of technologies, low access to capital funding, lack of environmental accountability, and lack of networking and collaboration among their peers in business operations.

Apart from these internal factors, external factors that also have impacts on Thai SMEs include: the changing global economics, the changing social structure and environment of markets, trade liberalization and the entering of markets from other countries, trade rules and regulations, the rapid change of technologies, and the shifting of labor cost structures

With the emergence of the digital economy, the trend of business operations has changed from resource-based operations to knowledge-based operations (Carlo et al., 2012). The impact to SMEs can be described as follows (Office of Small and Medium Enterprise Promotion, 2007). First, speed-based competition has replaced scaled-based competition. Second, knowledge-based, skill-based, and technology-based productions are replacing physical-asset-based production. Third, access to networks and business connections has greater importance than ownership or self-operation. Fourth, knowledge, skills, creativity, and intellectual property have become more vital to business operations than capital growth (Office of Small and Medium Enterprise Promotion, 2007).

Another driving force that shifts the operating model of SMEs is the approach of outsourcing. Rather than doing everything in-house, SMEs are partnering with their peers, focusing on the operational segments they can do best, and leaving the unfamiliar tasks to others. This approach allows knowledge-based and technology-based SMEs to be specialized in their business network and capable of expanding into a new market segment or niche.

2.7.2 Thai SMEs Facts and Figures

According to the Ministry of Industry of Thailand, "a firm is considered to be a small enterprise when such company has working staffs of fewer than 50, with paid up capital of fewer than 50 million Baht (1.5 million USD)" (Ministry of Industry of Industry of Thailand, 2002, p. 18). Furthermore, "a firm is considered to be a medium enterprise when it has working staffs under 200, with paid up capital more than 50 million Baht but less than 200 million Baht (6 million USD)"(Ministry of Industry of Industry of Thailand, 2002, p. 18) .

The number of SMEs in Thailand account for 99.76% of all enterprises (Office of Small and Medium Enterprise Promotion, 2012b, p. 31). In terms of economy, they contributed as high as 36.6% of the country's GDP in 2011, with small enterprises representing 24.5% of the GDP, leaving the medium enterprise with a share of 12.1% (Office of Small and Medium Enterprise Promotion, 2012a, p. 3). The GDP structure of SMEs was greatly related to the services, manufacturing, and trade and maintenance, respectively (Office of Small and Medium Enterprise Promotion, 2012a, p. 7). In terms of employment, SMEs energize the country by having an employment ratio of 83.89% of all the employment in Thailand (Office of Small and Medium Enterprise Promotion, 2012b, p. 34). In terms of entry and exit, Thai SMEs in 2011

had entry to market at the rate of 9.11%, with a double exit rate at 18.8% (Office of Small and Medium Enterprise Promotion, 2012b, p. 37).

As can be seen, SMEs are the bloodline of the Thai economy. Even with the high turnover rate, the market still attracts newcomers. The puzzle is: How do they survive in such a fierce competition? According to Kim and Mauborgne (2004), this kind of fierce competition is an analogy to the "red ocean"—the ocean fills with blood from wild marine animals biting and eating one another. The red ocean is an analogy of the already existing companies competing with one another by grabbing and fighting for a greater share of a limited demand. As the market space gets more crowded, firm expectation for profits and growth declines and the product becomes a commodity.

Kim and Mauborgne (2004) suggest that the firms in the red ocean should strive to be in the "blue ocean", where marine animals live in coexistence. There are two strategies to enter the blue ocean space. The first strategy is to leave the existing market and create a new one; the second strategy is to expand the existing red ocean market and find a market niche where no one has ever been before (Kim & Mauborgne, 2004). The only way to get there is through innovation:

> Thailand's innovation performance is considerably below that of the leading high-income countries and increasingly weaker than that of other middle-income countries in Southeast Asia. It has one of the lowest level of Research and Development (R&D) spending and R&D workers in the region and continue to fall (OECD, 2013, p. 262).

This conveys that Thai SMEs do not support doing their own research and development. They have become common traders. They offer the products and

services that are widely available from many competitors. The key strength of doing business comes from the relationship with their supplying partners and the social relationship with their clients (Roxas, 2008).

2.7.3 Common problems encountered in Thai SMEs

According to the Office of Small and Medium Enterprise Promotion Plan (2007), the potential problems that Thai SMEs are likely to encounter can be summarized as reported in Table 2.26.

Table 2.26: Common problems in Thai SMEs

Problem Encountered	**Description**
Financial Problem	SMEs are having problems accessing sources of funding. This may result from the lack of good accounting systems. Without a good accounting system, transparency becomes a primary concern, causing financial institutions to be unconfident to grant loans.
Management Problem	SMEs tend to lack the understanding of the market and its customers. Most of the SMEs are owned and operated by the owners who have the rightful and sole responsibility for making decision. This sometimes results in a lack of good vision and an inability to foresee market opportunities.
Technical Problem	Most of the SMEs still use conventional, outdated technologies due to budget constraints, or they underutilize the capability of acquired technologies. Failing to catch-up and utilize current technology causes them to fall behind the competition.
Marketing Problem	SMEs tend to use their familiar channels to conduct marketing activities. This prevents them from expanding the scope to include new potential customers who are more complex and diverse.
Products Problem	This is crucial problem because SMEs see new products or service developments as a burden to their business.
Human Resources Problem	SMEs employ low-educated workforces and are unable to retain or recruit skilled workers and mid-level technicians.
Production Costs Problem	SMEs use low quality raw materials, lack material improvement or development, and bear high logistic costs. This result in low quality goods or services and less competition capability due to higher operational costs.

Source: Adopted from Office of Small and Medium Enterprise Promotion (2007)

2.7.4 Thai IT SME Ecosystem

As claimed by Ernst and Kim (2002), the common supply chain in IT SMEs industry begins with the product owner. This owner is normally located in other countries, dominated by European and US companies. Product owners perform the research and development activities. In distributing products and carrying the sales and marketing activities, these companies will appoint a regional office. The regional office, in some cases, will appoint a (local) country office to handle sales and marketing campaigns in each country. Country offices always look for local partners to help with sales and implementation. As an alternative, sometimes the regional office performs these activities in a cluster of countries within the region.

In terms of logistics, the regional office will appoint the local distributor(s) as a product delivery channel. As a partnering office, the IT SMEs always contact the distributor for the distribution of products and the country office (or regional office) for sales and marketing support.

In terms of technical assistance, sometimes the regional office appoints an engineering entity to serve for their products and services installation. The dominant characteristic of this whole process is the low cost, speed, and flexibility of delivery (Ernst & Kim, 2002). If the engineering service company exists, the local partners will perform only the sales function, leaving the technical issues to this engineering office. In many cases, the engineering office does not exist. In this case, the local partners have to establish their engineering department to deal with technical issues by themselves.

Global technical support centers support technical issues during the installation and maintenance phase of the local partners (Ernst & Kim, 2002). This is always a

subscription service included with the initial product purchase or as a part of a Maintenance Agreement (MA) contract. Figure 2.16 illustrates the ecosystem of the IT SME industry in Thailand. The model was developed from a field survey conducted with many IT SMEs.

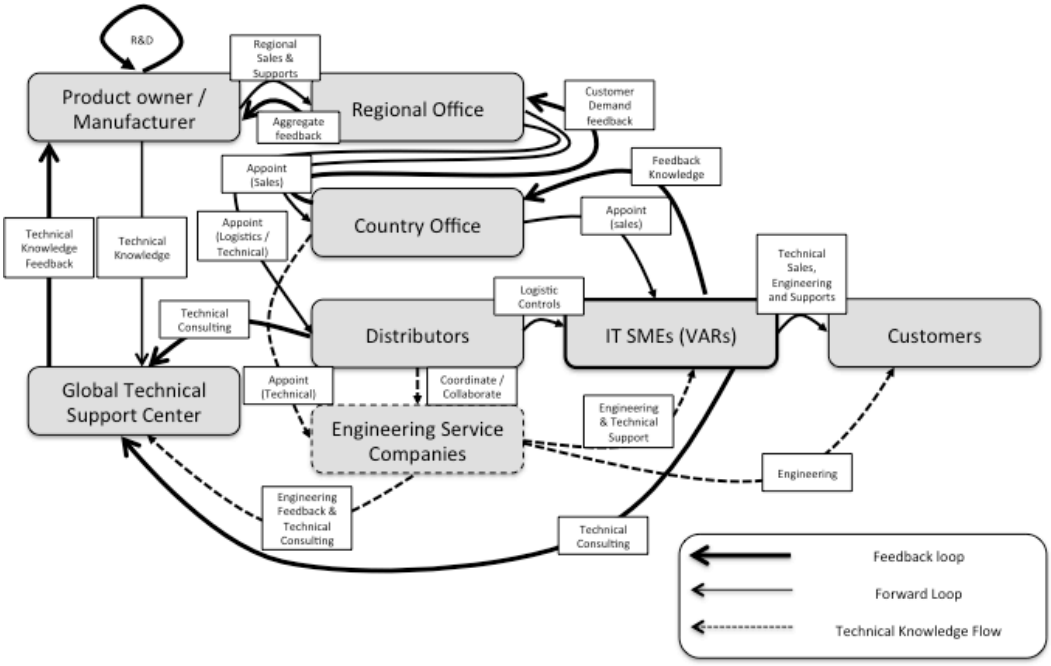


Figure 2.16: Thai IT SME business ecosystem and supply chain

In terms of knowledge flows, sales and marketing knowledge is normally a one-way flow from the product owner/manufacturer through the regional office, through the country office, to the local partners. The global product suppliers “can exert considerable pressure on local suppliers. They can discipline suppliers by threatening to drop them from the [distribution] network” (Ernst & Kim, 2002, p. 1422). The global partners have a strong influence on knowledge transfer along the supply chain. Sales and marketing partner workshops are organized throughout the year to share new information about new products and the offering marketing campaign, and to

strengthen network ties among partners to prevent the conflict of different partners selling to the same segment of customers (Ernst & Kim, 2002).

This differs in terms of technical knowledge flows. The technical learning about products comes in four forms—supplier formal mechanism, prototype acquisition and hands-on learning, informal mechanism through technical assistant, and observation and literature (Ernst & Kim, 2002). In some strong product companies, for example, Cisco and Microsoft, the partners' engineers are required to pass a technical exam certification. The certification has an age limit and it is sometimes bound to the model of the product. To be eligible to support their products, the engineers must pass the exam, with the burden of expense on the partner companies. For a weaker product, the product owner, through their regional and country office, will provide technical training from time-to-time with the sharing of expenses between the product owner and partners.

Technical knowledge gained from the field comes from problems encountered by the local partner's engineer when implementing the product to the customer (Ernst & Kim, 2002). Issues on problems found are reported back to the product owner/manufacturer through the supporting global technical support center. Problems and issues are logged, and the solutions to problems are produced. The feedback of how problems and issues are addressed is then fed to the manufacturer for the development of new updates, bug fixes, or release of new product versions.

Technical knowledge is exchanged along the supply chain within the partnering circle (Ernst & Kim, 2002). However, sales and marketing knowledge is retained inside the local partnering firm (Ernst & Kim, 2002). Each local partner develops business rapport and social relations with its clients. This creates a sense of customer

loyalty and enhances the degree of monopoly in terms of customer's vendor preference.

2.7.5 A special focus on IT SMEs

The IT SMEs sector inherits the same deficiencies of SMEs. This makes this business sector very interesting to explore since they survive in such a fierce competitive market. Since within this industry sector SMEs do not do their own R&D for new product development, they seem to position themselves as IT product brokers (Office of Small and Medium Enterprise Promotion, 2007). They become common trading companies that import products, and perform installation and configuration to fit those products. The market entry has a very low barrier (Office of Small and Medium Enterprise Promotion, 2007) . There are new companies continuously entering the sector and, at the same time, many are leaving. However, there are many that earn their living in this business market and survive over long periods of time (Roxas, 2008).

The IT market is a very fast moving, highly dynamic market. New technical knowledge, new approaches, and new standards are continuously emerging. IT products can become obsolete in 6 months (or less). These autonomic characteristics naturally force IT SMEs to adopt new knowledge almost instantaneously in order to cope with ever-changing demands of customers and to catch up with the latest technological advances in order to remain competitive (Boutros & Purdie, 2014).

In addition to the rapid movement of IT products, the threat from government is another force with which SMEs must comply. New legislative regulations from government strictly oblige the companies to conform to a new law, or even adopt new IT solutions to comply with a new law. For example, the law requires a company to

keep the transaction log of all e-mail records with the origins of mail senders and the destined recipients for 90 days (Computer Crimes ACT B.E., 2007). This forces all the companies to comply with the law by installing log and transactional severs for themselves and to serve their customers as well.

Sometimes a single IT SME cannot offer a comprehensive supply equal to the customer's demand. When this occurs, SMEs must team up to offer a complete range of combined products. While each SME has a specific part to perform, this requires coordination, and learning how their products will interact with the products of others. This also requires exchanges of knowledge among peer partners. The products may share some common ground or come from a totally different knowledge foundation. In this case, product combination creates the perfect ground for new external knowledge absorption.

2.7.6 IT SMEs and absorptive capacity research

Absorptive capacity, as per the definition given by Cohen and Levinthal (1990) in their original construct, is "the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends" (p. 128). This requires the firm to pay attention and invest in developing knowledge from external sources. Absorptive capacity would undoubtedly be the mechanism to help IT SMEs to commercialize and sustain their businesses.

IT SMEs are the perfect setting to study the impact of absorptive capacity. Thai IT SMEs do not perform their own R&D, thus leaving themselves as simple trading firms. This eliminates product differentiation, which enables higher chances of survival in the target market. Another aspect relevant to this research study regards the high velocity of these markets. IT products keep changing all the time. This

automatically enforces IT SMEs to learn and re-learn new technology. Since they are SMEs, they have limited resources or training funds. The engineers must learn new technology and learn it fast to cope with the dynamism of market change. Formal training is not always the case; exploratory learning from actual fieldwork is instead a common case for learning.

Another issue of these markets relates to the quality of engineers. Engineers employed by SMEs are usually less skilled compared to bigger firms who can afford higher cost graduates. The intrinsic contradiction is that these engineers must become experts in short period of time, as they must provide service to their customers. Their learning must be able to correspond to the customer's inquiries regarding new technical perspectives and challenging issues.

This supports the reason to study the internal capabilities of absorptive capacity in IT SMEs, as a potential fruitful contribution for managerial practice.

2.8 Conclusion

In this chapter I discussed my systematic literature review process, the criteria used in the selection and analysis of articles, the chronological evolution of absorptive capacity and relevant concepts, and the systematic analysis of its components, mechanisms, and capabilities as described in the retrieved and analyzed articles. It was found that since the publication of the seminal work by Cohen and Levinthal's (1989, 1990), the construct of absorptive capacity had been revisited and improved in subsequent work. Zahra and George (2002) firstly contributed to these improvements, including dynamic capabilities in their revisited construct. However, this revisited construct amended some conceptual stances of the original work. Todorova and Durisin (2007) examined the work of Zahra and George (2002) and proposed further

amendments that included some of the missed conceptual stances originally developed by Cohen and Levinthal (1989, 1990). This research study is based on the work of Todorova and Durisin (2007) which did not alter the original definition and meaning of the seminal construct.

Lewin's et al. (2011) absorptive capacity meta-routines work was also included as part of the theoretical lens of this study. Lewin el al. (2011) defined an operational frame for explorative study on knowledge absorption and provided a way to examine how firms in IT SMEs absorbed new knowledge and what factors impacted this absorption. From the combination of studies included as part of this systematic literature review, a framework (Figure 1) was developed which guided the subsequent steps of this research study.

The complete list of reviewed articles is made available (N=189) and can be found in Appendix 2.

CHAPTER 3

METHODOLOGY

In this chapter, I discuss the philosophical assumptions of my research study with specific reference to the ontology and epistemology, theoretical perspectives, methodology, and methods of data collection and analysis. Later in the chapter, I will discuss the motivation behind my research design, regarding the multiple case studies methods.

3.1 Philosophical Assumptions

This section discusses the philosophical assumptions of this research study regarding the way knowledge is induced or deduced from the real-world phenomena. My assumptions are based on the work of Alvesson and Skoldberg (2013) and Crotty (1998). Alvesson and Skoldberg (2013) identify an approach, namely the “abduction” approach. This approach best explains the ontology, epistemology, theory, methodology, and methods of my research study. The semantics of research terms described by Alvesson and Skoldberg (2013) are based on Crotty's (1998) work.

Abduction blends the argumentative of the deductive approach, commonly used for natural science research, and the inductive approach, commonly used for social science research. It is the approach used widely for many case study methods (Alvesson & Skoldberg, 2012). Abduction starts and embraces theoretical preconceptions, which is close to deduction in theory. Then the analysis moves to empirical facts, in combination with previous theory in the literature, as the source to

provide discovery of patterns that bring understanding (Alvesson & Skoldberg, 2013). The analysis part to bring out new theoretical knowledge is the “induction” process.

The reason why abduction is a more suitable approach than the purely induction or deduction approach is that induction derives theory and knowledge from the data. It is a mechanical means to explain the data. Deduction also gives a faulty impression of the research process as it draws the conclusion from the pre-proposed theory. Abduction bridges the gap between the two by imposing the explanatory model that the facts are always theory-laden (Alvesson & Skoldberg, 2013).

In this study, I took a constructionism epistemological perspective where reality was to be discovered by the interaction of humans, taking an abductive approach to derive knowledge from the research setting. The abductive approach combines both inductive and deductive approaches (Alvesson & Skoldberg, 2013). The actual evidences were examined, and combined with the researcher’s experience to explain what happened and how it happened (Alvesson & Skoldberg, 2013).

This research study was not about finding the causality of an event, so quantitative methodology would clearly not be a suitable choice. On the other hand, a pure qualitative and explorative study would not fit with the overall purpose of this study to apply meta-routine frameworks to the study of absorptive capacity.

Therefore, reflexive methodology was considered as a better fit where a framework developed from the systematic literature review guided empirical explorations to examine the actual situation and events, capturing empirical evidence which would be interpreted and bounded to the construct of absorptive capacity.

The research was based on the work of Todorova and Durisin (2007) and developed based on evolutionary theory of organizational adjustment to market

turbulence in order to explore how firms in IT SMEs adjusted to the required change. However, along the exploratory process, the research also explored those factors that impacted the new knowledge absorption.

The empirical findings were compared to actual collected data. Differences between empirical and actual absorption of new knowledge were identified, analyzed, and synthesized. From an epistemological stance, findings of new influencing factors that impacted the mechanism of new knowledge absorption were derived. The real phenomenon was reflected upon.

Multiple case studies were explored. The case study was the perfect approach for the identification of events in deep details. The level of analysis was at the firm level. This research study looked at the processes of absorptive capacity from a meta-routine perspective rather than just a specific exception or project initiative.

In the following sections I briefly explained how the current literature discusses the most prominent ontological, epistemological, and methodological perspectives, and I would provide details that would help clarify my research design and approach.

3.1.1 Ontology, epistemology, theoretical perspective, methodology, and methods

Crotty (1998) suggests that in developing a research proposal, there are four elements that justify the selected methodology and the methods. These four elements are epistemology, theoretical perspective, methodology, and methods. The definitions of these four elements are shown in Table 3.1.

Table 3.1: Definition of epistemology, theoretical perspective, methodology, and methods

Element	Definition
Epistemology	Theory of knowledge embedded in theoretical perspective and in methodology.
Theoretical Perspective	The philosophical stance informing methodology and context for the process and grounding its logic and criteria.
Methodology	The strategy and plan in designing the research process to identify the use of methods to produce the desired outcomes.
Methods	The techniques or procedures to gather data and analyze them to provide answers to the research questions.

Source: Adopted from Crotty (1998, p. 3)

In Alvesson and Skoldberg (2013), and Crotty (1998), the concept of ontology is not differentiated from the one of epistemology. “Ontology is the study of being. It concerns with ‘What is’, with the nature of existence” (Crotty, 1998, p. 10). Ontology exists alongside of epistemology, which also guides the theoretical perspective. The theoretical perspective provides the answer to ‘what is’, which is the notion of ontology, and ‘what is meant to be’, which is also the notion of epistemology. In this sense, ontology and epistemology seem to merge together and should not be differentiated (Crotty, 1998).

The term *realism* and *relativism*, which is the notion used in ontology, can also be matched to *objectivism* and *constructionism* in epistemology. Objectivism is the view of things that exist and the truth and meaning residing in the reality of the object (Crotty, 1998). Constructionism applies to human as opposed to objects of things in that there is no objective truth waiting to be discovered. “Truth, or meaning, exists with reality in the world. There is no meaning without a mind. Meaning is not discovered, but constructed. Different researchers may interpret the discovery of meaning differently, regarding the same phenomenon” (Crotty, 1998, p. 9).

Another terminology residing alongside of objectivism and constructionism is subjectivism (Crotty, 1998). Subjectivism comes from the superimposing of a subject over an object. In constructionism, meaning is derived from the object while in subjectivism, meaning is imported from somewhere else. It may come from a dream, cultural imprints, religious beliefs, or an unconscious model.

3.1.2 Positivism, Post-positivism, Critical Realism, Social Constructionism, and Postmodernism

According to Crotty (1998), positivism is the knowledge of science that sticks with what can be observed and measured. Anything else beyond that is ignored. The main methodology of positivism is quantitative data collection using statistical analysis as the tool to convey the results. Positivism is considered the dominant philosophy of science. The key belief is there is a single truth about the phenomenon and this truth is already there to be discovered and is firmly linked to empirical science. Knowledge elicited from positivism is both accurate and certain. This eliminates the opinion or interpretation concerning opinions, beliefs, feelings, and assumption (Crotty, 1998).

According to Lincoln and Guba (1985), positivism needs to have five distinct conditions. First, the research on natural science is with the assumption that the singularity of reality is out there waiting to be discovered. Second, there is the possibility that the separation between the observer and the phenomenon may occur. Third, there is the assumption that what is observable and true at one time, may also be true at another. Fourth, there will always be cause and effect. Fifth, the evaluation of results is unambiguous and free from being influenced or biased. These conditions make positivism difficult to maintain.

Post-positivism is theoretical science that cannot be measured directly, but does exist (Crotty, 1998). Post-positivism is seen as the fixate for the failing positivism (Lincoln & Guba, 1985). Positivism is focused on surfacing the results, while post-positivism focuses on the details of the results. Positivism looks at detail at the granular level of an element, while post-positivism looks at the systemic and structural level. Positivism looks at the prediction of an event, while post-positivism looks at the probabilistic and speculative (Crotty, 1998).

Just like positivism, post-positivism does not focus much on cause and effect (Creswell, 2013). It rather recognizes research as a series of steps involving multiple perspectives with multiple truths of realities.

Critical realism sees both the positivism and social constructivism as superficial and non-theoretical in conducting research and analyzing the findings to formulate theory (Alvesson & Skoldberg, 2012). The objective of critical realism is to find the process or mechanism to generate empirical phenomena. It focuses on how people think, the encouragement to interact, the social networking, and formation of action-oriented groups (Creswell, 2013) .

Reality in critical realism consists of three domains—empirical, actual, and real (Alvesson & Skoldberg, 2013). Empirical is what can be observed and derived from the researcher's experiences. Actual is the event that manifests itself independent of the researcher's influence. Real is the mechanisms that produce different events and other surface phenomena. In scientific research, the researcher is looking for real evidence and how it relates to the other two domains. The researcher will identify the relationships between the researcher's experience and what actually happens, and the

underlying mechanism that brings the event out into the world (Alvesson & Skoldberg, 2012).

Social constructionism is the study of how reality is socially constructed (Alvesson & Skoldberg, 2012). It is based on the fact that all objects are made, not found (Crotty, 1998). It is about individuals seeking to understand the world they live in (Creswell, 2013). In social constructivism, researchers try to blend and observe to understand the views of participants and how they see the world in situation.

Creswell (2013) claims that researchers will inductively develop theory from patterns of meaning. They observe the process of interaction among participants and focus on specific contexts to understand the environmental impact and cultural settings of the research space. Social constructivism relies on interpretation of observed field notes and artifacts. This is sometimes called interpretive research.

Postmodernism deals with the criticism on changing the way of thinking, rather than calling for actions (Creswell, 2013) It involves changing the conditions of variables, such as race, genders, class, and other groups of affiliations. Postmodernism starts to transform into many types of research paradigms including feminism, race theory, disability theory, queer theory, etc.

3.1.3 Quantitative, Qualitative, Reflexive methodology, and Hermeneutic Interpretation

Choosing whether research should be quantitative or qualitative depends on the research problems and research objectives, guided by the epistemology of knowledge and the theoretical perspective (Alvesson & Skoldberg, 2012).

Quantitative methodology deals mostly with natural science research. It is almost always used with the deductive approach to deduce knowledge from the foundation of

hypotheses with a solid foundation of literature and theory. It supports the cause and effect discovery scheme (Crotty, 1998).

Quantitative methodology is suitable for scientific research, empirical science, and experimental research if a specific action produces a specific outcome. Quantitative methodology can also be used in a social science study in the following situation (Creswell, 2013). First, it is used in applied behavioral analysis or single-subject experiments, where the observation of treatments over time is administered to a single individual or small number of individuals. Second, it can be used with causal-comparative research, where the two causes are compared. Last, it is used in correlational design where correlational statistics are used to determine the degree of relatedness or relationships.

Quantitative studies always rely on statistical tools in analyzing the results of the quantitative survey data. In quantitative studies, it is the data that shapes the knowledge (Creswell, 2014). In quantitative analysis, only two variables can be measure at a time, and if there are more variables, one variable must be fixed. In other words, one variable needs to be fixed, another to be varied, and the third variable to be observed. However, in social constructionism, multiple variables can exist and cannot be controlled at the same time.

Qualitative methodology is always used when the research is reading the behaviors and interactions of humans. Data analysis in qualitative studies can be inductive, deductive, or the analysis of patterns or themes (Creswell, 2013). However, most qualitative analyses use inductive reasoning, often requiring researchers to work between characteristics and themes, until a common set of themes are identified. In contrast to deductive approaches, a set of themes is defined and the data are collected

and analyzed to prove the themes. Researchers who use a combination of approaches, or inductive-deductive approach, can use complex reasoning to cross-analyze data captured from both approaches to validate and confirm the findings. This approach is called mixed-methodology.

Denzin and Lincoln (2005) have given the definition of qualitative research as follows:

> Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretative, material practices that make the world visible. These practices transform the world. They turn the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. Qualitative research involves an interpretative, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them (Denzin & Lincoln, 2005, p. 3).

Creswell (2013) has developed several criteria to judge when qualitative research may be the suitable approach over the quantitative one: (1) when a problem or issue needs to be explored. This happens when the study group or population variables cannot be easily measured, or there is some hidden agenda that needs special attention to identify. Predetermined information from past literature or results from other researchers cannot provide enough ground to do quantitative research. (2) When a problem or issue requires complex details to be understood. These kinds of details can only be obtained from individual discussions or direct observations of how the individual or group of individuals interact. (3) When the research is clustered around

individuals or groups of individuals and their stories and voices are what the researcher is looking to investigate. (4) When a narrative interpretation of one's story in informal and flexible styles of data capturing is involved in the research. (5) When specific contexts or different types of settings impact the results of the research. (6) When qualitative research is used for validating the results from quantitative research, or vice versa, to confirm and explain the linkages in causal theories or models. (7) When existing theories cannot explain the phenomenon and the researcher needs to formulate new theory from partial or inadequate information that is available. (8) When qualitative analysis better explains the phenomenon and the statistical analysis approach does not fit the problem.

Reflexive methodology is also used in empirical research. It involves the two basic characteristics of interpretation and reflection (Alvesson & Skoldberg, 2012). Interpretation is the notion that the empirical research is the result of the interpretation. In social science, all truths come from the interpretation of researchers. Refection is the result of the secondary information that was derived from the primary interpretation. In other words, reflection is the interpretation of interpretation (Alvesson & Skoldberg, 2013).

In reflective methodology, the researcher is the tool to deliver results (Alvesson & Skoldberg, 2013). Researchers put themselves in the middle of the research process and may guide the participants and the direction of the research study. Reflexive methodology is used in social science research when the following four conditions are engaged (Alvesson & Skoldberg, 2012).

The first condition is the 'systematics structure and techniques in research procedure'. Reflexive methodology combines the scientific research structure and

applies it over the social science research. The systemic and solid structure is put in place to conduct the research when dealing with empirical evidences. Rigorous techniques are used for data analysis.

The second condition is the ‘clarification of the primacy of interpretation’. Research results are purely derived from the interpretative analysis. Activities in interpretation, including hermeneutic interpretation, involve narrative interpretation, thematic coding and analysis, etc. The outcome is the interpretative results driven by the interpreter.

The third condition is the ‘awareness of the political-ideological character of research’. This is when the research deals with ethical or political context. It reveals the social conditions. Different social conditions depend on different settings, and different settings depend on the research problems and how reality is represented and interpreted.

The last condition is the ‘reflection in relation to the problem of representation and authority’. The researcher represents the hermeneutics of the problem. The researcher is the authority that decouples the text. Texts are related to one another but may become independent when the texts are split for analysis and then synthesized to formulate the results.

When these conditions are met, the research methodology is to be reflexive. The key underlying approach of reflexive methodology is the hermeneutic interpretation.

The meaning of hermeneutics is ‘to interpret or to understand’ (Crotty, 1998, p. 88). It is the science of interpretation that provides guidelines for scholars when engaging with the interpretation of scripture. In natural science research identifying the cause and effect is the primary goal, while for social science the aim is to gain an

understanding of the subject. This borderline leads to the comparison to gain wider generality of understanding the subject. Hermeneutics is the way to put social science on equal footing with natural science in these matters. Thus hermeneutics is the sharp dividing-line between the studied subject and object (Alvesson & Skoldberg, 2013).

The key principle of hermeneutics is that the understanding of a part can also lead to the understanding of the whole (Alvesson & Skoldberg, 2013). If a part of a subject is known and understood, then the whole truth about the subject can also be understood.

In addition to the principle of *understanding part will lead to understanding the whole*, hermeneutics also bridges the pre-understanding and understanding (Alvesson & Skoldberg, 2013). The process of hermeneutics is to base the research on some theorizing context and explore the experiences, beliefs, and values embedded in that context (Crotty, 1998). This is the process of confirming the pre-understanding, revealing it into the understanding form.

Hermeneutics is a sharing of meaning between communities or persons. This indicates that hermeneutics is not just for scholastic academia, but a practical solution (Crotty, 1998).

3.1.4 Reflexive interpretation

In this section, I would discuss the reflexive interpretation, clarifying its major characteristics and levels. Reflexivity is a way of seeing by reflecting back on the existing way of seeing (Alvesson & Skoldberg, 2013). It involves interpreting the existing context and reflecting back for the implications and hidden underlying messages through which the research is produced (Alvesson & Skoldberg, 2012).

The idea of reflexive interpretation is to gain validity and integrity through the reflection on text production and confirmed unambiguity in language used (Alvesson & Skoldberg, 2013).

There are four levels involved in reflexive interpretation (Alvesson & Skoldberg, 2013). The first level is the *data collection*. At this level, the empirical materials are dealt with and the degree of interpretation is very low. The second level is the *interpretation* level. At this level the collected data are analyzed and interpreted into collections of categories or concepts to identify the underlying meaning. There are two kinds of categories—in vivo and vitro codes (Alvesson & Skoldberg, 2012). In vivo code is the category found directly in the material, while the vitro code is the category the researcher derives from other external linkages.

The coding paradigm to code and categorize data contains four types of code data (Alvesson & Skoldberg, 2012). First, the coding is to look for the *conditions* to which the data pertains. This is the causality part that leads to an event. The second code data is the *interaction among actors*. This identifies the social interactions and relations among players in the process flow of analytics. The third code data is to look for the *strategies and tactics*. This identifies relevant factors that lead to supporting decisions and actions. The last data code is the *consequences.* This defines the effects part of the event. Combining the interpretation process up to this stage is termed a 'double hermeneutics' interpretation (Alvesson & Skoldberg, 2013).

The third level is the *critical interpretation*. At this level, the ideology of categories is then mapped and reshaped onto the theoretical ground. This is also called 'repertoire of interpretation', which means the interpretation is given priority, that others see as possible but not readily emphasized, or may not yet see as possible

(Alvesson & Skoldberg, 2012). This is the deductive approach in eliciting knowledge from combining the existing theory with the extracted categorical information from the interpretation process. Combining double hermeneutic interpretation with this level of analysis is termed ‘triple hermeneutic’ interpretation. The deductive approach, which is a normal epistemology of natural science research, always bases the research on well-founded research theory or concepts. Data is collected to confirm the theory. The inductive approach, on the contrary, takes an opposite approach to developing knowledge, using the data to develop the theory. In this way, knowledge is induced from the ground to formulate the new concept or theory.

The fourth level of interpretation is the *reflection process*. In this level, the interpreted information is reflected in order to allow the emerging theory to be viewed in various aspects, to yield theoretical breath and variation and the ability to reflect at the meta-theoretical level (Alvesson & Skoldberg, 2012). When the research is conducted, usually the third level of interpretation, the pre-structured understanding of the study context, dominates the seeing. This is called the ‘cognitive bias’. The reflective interpretation level overcomes this limitation. The reflective process to confirm theory is the triangulation form of confirming validity from multiple sets and data collection methods of empirical evidence.

3.1.5 Case Study and Multiple Case Studies Methods

The case study method was used widely in psychological, sociology, political science, anthropology, social work, business education, nursing, and community planning (Yin, 2014). It allows researchers to focus on a specific set of individuals, groups of individuals, or even among groups. The unit, in itself, contains various dimensions of data that can be interpreted or even generalized into common findings

(Creswell, 2013). Some researchers (e.g., Creswell, 2013) believe that the case study method is suitable for the exploratory phase where not much information is available to formulate the causality of factors and events. In contrast, other researchers (e.g., Stake, 1995) believe that each case is a unique phenomenon, that causality cannot be generalized into commonality but remains as a unique phenomenon.

The purpose of the case study method is to investigate the uniqueness of things, not to generalize from them. A thing can be a person, a group, multiple groups who share common characteristics, institutions, ethnic groups, a country, an event, or a phenomenon (Baxter & Jack, 2008; Thomas, 2011). The purpose of the case study is to look at relationships and processes underlying interactions among members in the studied group. A case study enables seeing one thing in completeness from many angles to gain a rich picture with analytical insights (Stake, 1995; Thomas, 2011).

The case study method is not about generalization. Events in each case have their uniqueness. When conducting a multiple case study, it is not about the generalization of patterns, but to interconnect the relevancies and processes (Thomas, 2011). The interconnection is accomplished by the experience and judgment of cause and effect in particular cases (Yin, 2014).

A case study provides ways to see things as completeness. This holistic approach is based on the assumption that the whole is more than the sum of its part. “It’s about seeing things in their entirety and realizing the totality of an event” (Thomas, 2011, p. 48). Thomas (2011) argues that all cases can be classified into three types. The first type is the *local knowledge* case. This type of case study is for the personal interest of a researcher to find out more regarding an event. The second type is the *outlier* case. This is the perception of an event or phenomenon that differs from the norm. The last

type is the *key* case. This is the type of case study that reveals the ground of common types of events or phenomena.

According to Thomas (2011) a case should be: *Intrinsic*, if the aim is to develop a theory. *Instrumental*, if the aim is to test a theory. *Evaluative*, if the aim is to evaluate the detail of the case. *Explanatory,* if the aim is to discover the description of the event. *Exploratory*, if the aim is to explore all possible conditions that cause the event to emerge. Table 3.2 summarizes the approach proposed by Thomas (2011).

Table 3.2: Type, purpose, approach, and process frame for doing case study research.

Type of case	**Purpose**	**Approach**
• Local • Outlier • Key	• Intrinsic • Instrumental • Evaluative • Explanatory • Exploratory	• Testing a theory • Building a theory • Drawing figures and models • Descriptive • Interpretative

Source: Developed from Thomas (2011)

There are three possible uses of case studies: (a) explanatory or causal case study, (b) descriptive case studies, and (c) exploratory case study (Yin, 2014). The decision of which type to use depends on the posted research question, the control of the researcher over behavioral events, and the degree of focus on historical evidences.

For my research study I explored an area, i.e., absorptive capacity meta-routines in IT markets, where little previous research had been done before. The goal was not to find cause and effect, but to derive common themes of absorptive capacity internal capabilities, which would be best induced by the case study method. I based my study on the empirical study of Todorova and Durisin (2007) in combination with the meta-routines construct of Lewin et al. (2011) and explored details of exploratory regimes

(see also Senivongse et al., 2014). The aim was to identify how new knowledge was absorbed by IT SMEs from an evolutionary theory standpoint.

Another key consideration was the unit of analysis. The unit of analysis can be individual, multiple individuals, groups of individuals, multiple groups, or the firm level. In this research study, and to adhere to the original construct of absorptive capacity, multiple case studies were performed at the firm level.

3.1.6 Multiple Case Study Method

Within the case study method, in my research study I focused on multiple case studies and specifically refer to Yin's (2014) multiple case study method (see Figure 3.1). The reason for choosing the multiple case study method was linked to my research questions, wishing to pursue an in-depth investigation of absorptive capacity from a meta-routine perspective in a group of SMEs in the IT industry in Thailand. From the literature review, there was not much information regarding the internal capabilities of absorptive capacity. By using absorptive capacity meta-routines as a guideline together with exploratory regimes, the multiple case study method represented the best fit for this research study.

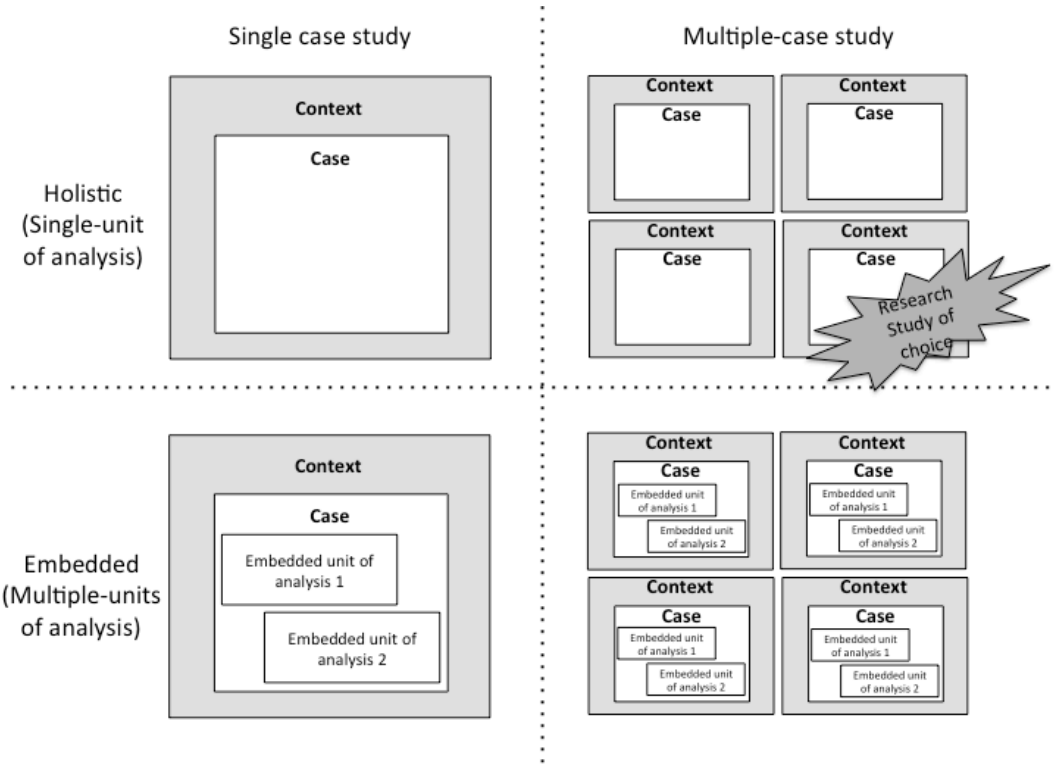


Figure 3.1: Four basic types of case study

Source: Adopted from Yin (2014)

Compared to a single case study where (1) the case represents a significant contribution to epistemology of knowledge; (2) there is an unusual anomaly from the theoretical norm; (3) there are some common processes relating to some theoretical interests; (4) there are some revelations to some phenomenon that are not accessible by other means; and (5) the case requires longitudinal studies for the facts to reveal themselves, multiple case studies involve multiple replications of the single case study (Yin, 2014). The rationale for selecting the multiple case study method is based on the assumption that multiple studies produce similar results, or that they produce different results that can be compared to identify anticipated reasons. Multiple case studies can also provide a means to validate reproducible results (Yin, 2014). If the result of one case is confirmed by the result of another, then trustworthiness and

reliability is confirmed. However, if one case contradicts another, then the unconformity should be re-tested by another case (see Figure 3.2).

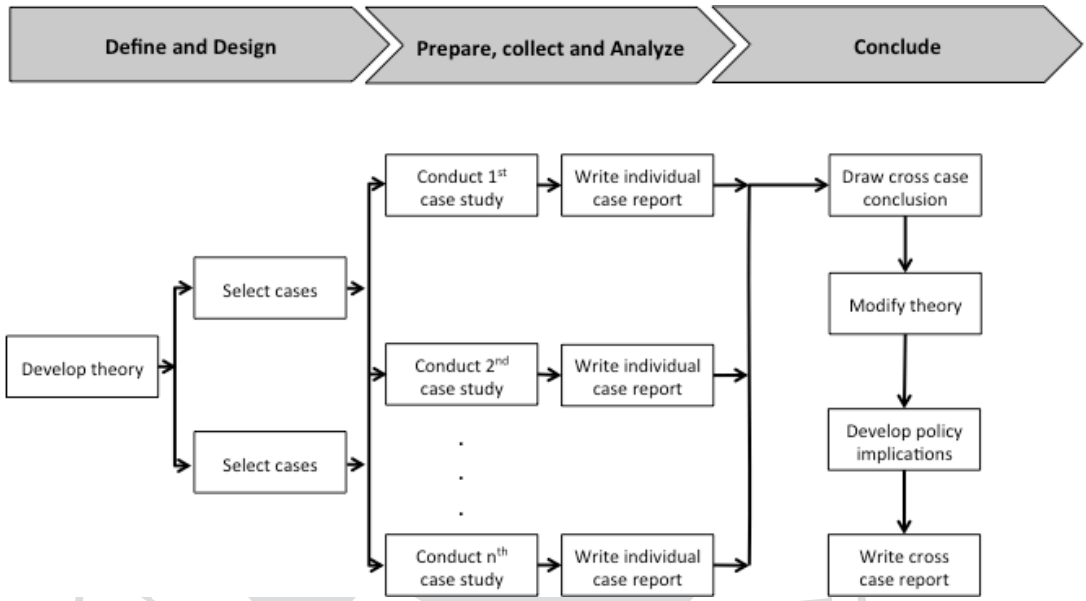


Figure 3.2: Steps in performing multiple case studies

Source: Adopted from Yin (2014)

Based on Thomas (2011)'s framework for the case study method, Figure 3.3 shows a possible development of a multiple case study method with specific indications of case type, purpose, approach, and process. My research study focused under the categorization of "key type" case study, that is, to define the unknown absorptive capacity internal capabilities. The purpose was to conduct intrinsic and exploratory data collection. The approach was to draw the routine processes of the internal capabilities and to interpret the facts on the four exploratory regimes as defined from the literature review. The processes of data collection and analysis involved multiple methods, including open interviews, observations, and artifact review.

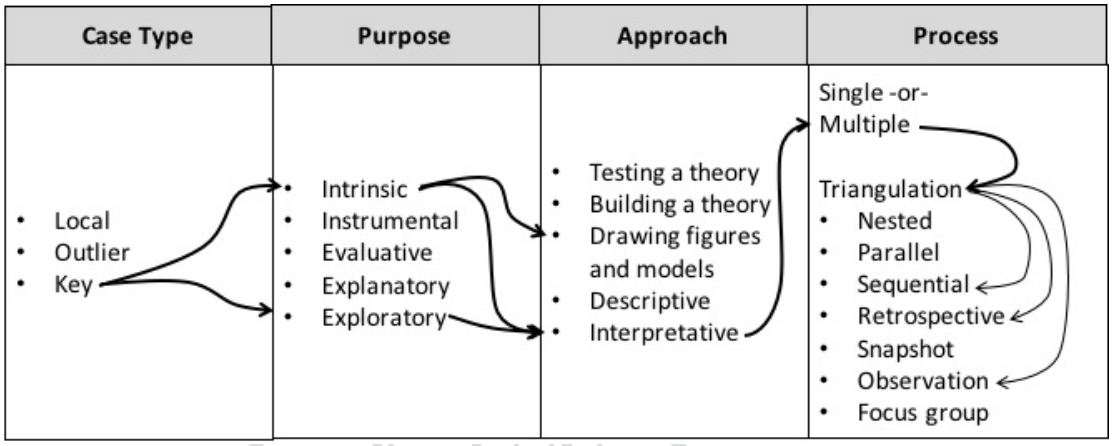


Figure 3.3: Development of multiple case study research

Source: Elaborated from Thomas (2011)

3.1.7 Philosophical assumption identification

Figure 3.4 and Table 3.3 provide a summary of the entire section regarding my philosophical assumptions, with specific reference to the ontology and epistemology, theoretical perspectives, methodology, methods and reasons behind my research design selection.

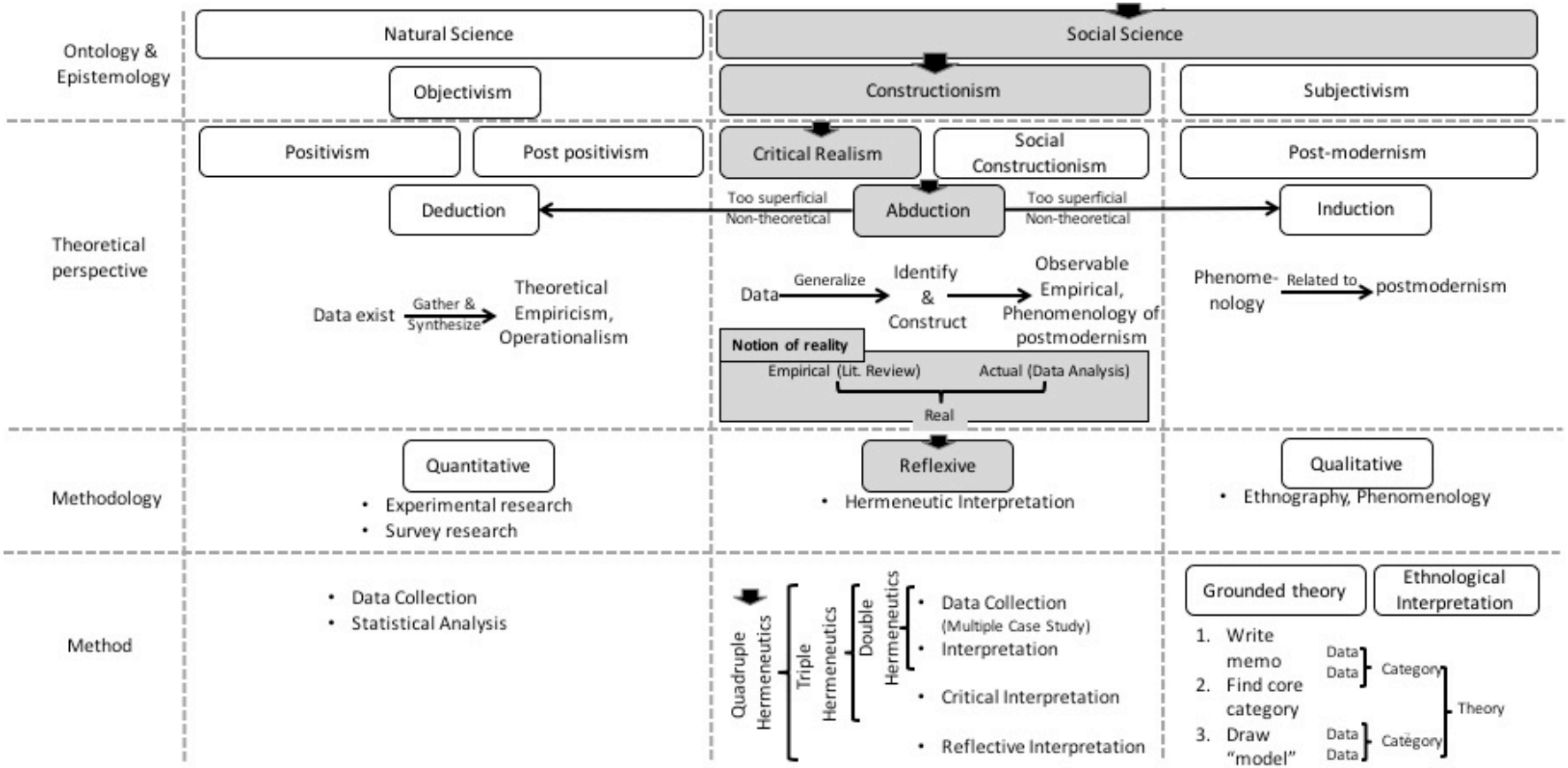


Figure 3.4: Framework on philosophical assumptions

Source: Adapted from Alvesson and Skoldberg (2013), and Crotty (1998)

Table 3.3: Philosophical assumptions description and explaining reasons

Theoretical Elements	**Paradigm**	**Reason to choose it in this research study**
Epistemology	Constructionism	This research study took a constructionism epistemological perspective where reality was to be discovered by the interaction of human. This was to understand how the knowledge was actually absorbed and processed within organizations.
Theoretical Perspective	Critical Realism	This research study used the abductive approach to derive knowledge from the setting environment. The framework guiding the study was developed from the literature review. Using a predetermined framework was clearly a deductive approach. However, to reveal the mechanism of how knowledge is absorbed and processed is the inductive approach, as the knowledge and theory have to be grounded. The abductive approach combined both inductive and deductive approaches (Alvesson & Skoldberg, 2013); the empirical was cross examined against the collected data for actual interpretation. The real phenomenon were examined, combined with the researcher's experience to explain what actually happened and how it happened (Alvesson & Skoldberg, 2013).
Methodology	Reflexive methodology	The study was not about finding the causality of event, so quantitative methodology would clearly not be a suitable choice. On the other hand, a pure qualitative and explorative study would not also fit with the overall purpose of this study to apply meta-routine frameworks to the study of absorptive capacity. Therefore, reflexive methodology was a better fit than pure qualitative or quantitative approaches where a framework developed from my literature review guided my empirical explorations to examine the actual situation and events, capturing empirical evidence which was interpreted and bound to the construct of absorptive capacity using solid structural systematic analysis approach.
Methods	Multiple case study	Multiple case studies were explored. The case study approach was the perfect approach for the identification of events in deep details. The level of analysis was at the firm level. This research study looked at the processes of absorptive capacity from a meta-routine perspective as a whole, rather than just a specific exception or project initiative.

3.2 Data Collection

In this research study, I collected data from multiple sources and performed data triangulation to increase the validity of my findings. According to Yin (2014), there are four types of triangulation: (1) different data sources (data triangulation); (2)

different evaluators (investigator triangulation); (3) different perspectives to the same data set (theory triangulation); and (4) different methods (methodological triangulation).

I used the data triangulation approach to collect data from different sources. These sources were: individual open-ended interviews, and on-site observations. Additionally, I collected private and public documents.

3.2.1 Selected IT SMEs

To collect data, I selected six IT SMEs of three types—Distributor (DI), System Integrator (SI), and Value-Added Reseller (VAR).

The first two IT SMEs were a System Integrator who provides IT solutions to corporate customers by integrating and blending IT networking, telecommunication, IT Security, and Maintenance and Support services. These companies were very much relying on the strength of engineers who must possess breadth and depth of knowledge in various fields. Most of the triggering decisions came from customer drives.

The second two IT SMEs were the distributor. One offered a focused closed-circuit TV (CCTV) and acted as the system implementer to corporate clients, and as a distributor of imported CCTV products. This SME sometimes offered the IT network installation and services in compliment to the sale of CCTV solutions. This company was a focused company. It did not deal much with the breadth of knowledge from various IT technical solutions, but, instead, it focused on CCTV variations. The second one offered the IT network security products. This company sold their products via their partnering channels.

The last two IT SMEs were a Microsoft Value-Added Reseller. They were partner of Microsoft selling the licenses and performed Microsoft product installation.

These six companies were selected because they differed in their knowledge triggering mechanisms. The unit of analysis was at the firm level, in line with the absorptive capacity meta-routine theorization.

3.2.2 Individual semi-structured interviews

Semi-structured interviews, sometimes referred to as *qualitative interviews* (Yin, 2011), were conducts with at least 5 participants per each case. Follow-up interviews were conducted as appropriate and needed. Participants were purposefully selected (Yin, 2011) according to the guidance of key informants and following a snow-ball approach (Gastaldi, Lettieri, Corso, & Masella, 2012) that would guarantee representativeness while maximizing collected data. The snowball approach engages the next interviewees by a reference from the last interviewee. The interview was guided by open-ended questions. The questions followed the critical incident technique (Flanagan, 1954; Hughes, 2007) and were preliminarily developed from the literature review and refined after two pilot interviews. The derived questions, including probe questions, were fully listed in Appendix 1. This list of questions is comprehensive in nature, and was reduced after conducting the pilot study case, that helped the removal and/or the reframing of existing questions, benefiting from the emergent nature of the research design. The questions were not circulated to the interviewees beforehand, nor was the interview piloted to provide answers in an arranged, predefined, way (Yin, 2011). Rather, the questions provided a basis for the emergent conversation between the interviewer and the interviewee, enabled by open-ended questions that allowed the interviewee to freely provide answers and supporting

evidence. Yin (2011) suggests the following qualitative interview techniques, which were implemented in this study:

Table 3.4: Interview techniques

Interviewer techniques	Supportive description
Speaking in a fair and modest amount	The person who does most of the talking is the interviewee, not the interviewer. The qualitative interview objective is to get the interviewee's worldview out of the session.
Being nondirective	Bias occurs from interviewer intervention.
Staying neutral	Do not take sides. This includes the wording used during the interview, the posture, the gesture, and expression.
Maintaining rapport	The interviewing context may "touch" or become sensitive to the interviewee. Avoid causing embarrassment, giving hardship, or doing harm to the interviewee.
Using interview protocol	Formal introduction, assurance of the non-disclosure of information, and explanation how information will be used shall be explained to the interviewee. Also use allowable recording device to help capture the details. Be transparent and be a trustworthy partner.
Analyzing while interviewing	A good interviewer always takes notes of the observations made by the interviewee. Gesture, wording, unclear meaning, referral to events, people, or evidences are things to ask for confirmation. This sidetrack information will be explored later.

Source: Adopted from Yin (2011)

3.2.3 On-site observations

"Observation is another means to sit in and observe in the actual environment without interfering with an unobtrusive setting" (Yin, 2014, p. 146). This non-interfering measure involves "nonreactive" situations, where the researcher cannot influence the participants' behaviors. In this research study, I spend time blending in and observing instances of potential knowledge absorption processes from triggering, to decision making, to absorbing, assimilating the knowledge, transforming and utilizing the new knowledge to produce outcomes. This flow usually occurred when there was a new project involving knowledge in a different field or from other partners outside the organization.

I observed the characteristics and roles of the bordering gateway agent, the social interaction among people along the knowledge generating chain, the incentive factors that motivate new knowledge assimilation and transformation, the physical setting and organization alignment and adjustment, and the flow of information and routines along the knowledge integration chain.

While conducting my on-site observations, I considered some of the major challenges of this data collection technique. For instance, a major challenge was the ability of the researcher to participate and understand the business context without intervention or asking questions (Yin, 2014). The second challenge was that the observation took place in a confined geological space. The third challenge was that observation required time to witness the whole absorption process. This made it hard for the researcher to completely observe and understand without missing major events or evidence. In this study, and to overcome these major challenges, I conducted intensive and prolonged observations, making use of templates and field notes to record my data. In total I spent 2 hours in each of the research settings.

3.3 Data Analysis

Data analysis was performed in three ways. First, the narrative review technique was used to analyze the contexts and research settings. This was to identify the goals, theories, and methods from the existing artifacts, reports, or field notes (Alvesson & Skoldberg, 2013) .

Second, I used thematic analysis. The interview transcripts were analyzed using thematic coding. Coding categorizes the findings and contexts into themes (Boyatzis, 1998). Data analysis were done with three levels—First order coding, axial coding, and aggregate coding (Maxwell, 2013; Pratt, Rockmann, & Kaufmann, 2006). In first

order coding, the objective was to group the wording used by participants for the purpose of sorting and facilitating further analysis. The axial coding (2nd order coding) was then used to group the descriptions of participants into common characteristics and themes. Aggregate coding then grouped all axial codes to facilitate theoretical descriptions.

Third, I used a connecting strategy to compare and derive the connections. The technique was used to juxtapose comparative sources to identify the connection between two or more sources. Juxtaposing helped eliminate the deficit of thematic analysis. It compared the relevant context and defined the linkage between data sources. In other words, connecting analysis provided a tool to help understand the data. It was a holistic approach to avoid fragmentation of the context (Jackson, 2008).

There were many tools involved in the analysis of data, collected from multiple sources. Since my research study took a meta-routine approach, I followed the thematic analysis defined by Boyatzis (1998) as the guideline to develop first-order and axial codes, in combination with the recommendations from Salvato and Rerup (2011) on the elicitation of routines.

3.3.1 Thematic Coding and Analysis

According to Boyatzis (1998), thematic analysis is a process to be used for analyzing transcribed textual content and encoding it into qualitative information. The encoding breaks the content into themes. A theme is a pattern found in information that, at a minimum, describes and organizes the possible observations and, at the maximum, interprets aspects of the phenomenon (Boyatzis, 1998).

The key objective of thematic analysis was to identify the patterns recurring within the text. There were three stages in developing themes and encoding under thematic

analysis: deciding, developing, and validating. In stage 1, the researcher decided on the sampling and design issues of how the themes were to be developed. In stage 2, themes were developed and encoded. In stage 3, themes and codes were validated using the code.

According to Boyatzis (1998), there are three ways to develop the code: (a) theory-driven, (b) prior-data or prior-research-driven, and (c) inductive or data-driven. Theory-driven is more supportive of the deductive approach. Theory governs the decision and selection of the code. Researchers refer to the theory and develop the code consistent with the theory. Prior-data or prior-research-driven is the development of the code based on the findings or results from previous research. This supports the validation of someone else's thematic analysis. The data-driven approach is used when a researcher is to inductively construct new knowledge based on captured raw data. Table 3.5 summarizes the different stages and the steps in performing thematic analysis.

Table 3.5: Summary of stages and steps in using thematic analysis

Stage	**Theory-driven**	**Prior- research-driven**	**Data-driven**
1	Deciding on sampling and design issues	Deciding on sampling and design issues	1. Deciding on sampling and design issues 2. Selecting sub-samples
2	1. Generating code from theory 2. Reviewing and rewriting the code for applicability to the raw information 3. Determine the reliability	1. Generating code from previous research 2. Reviewing and rewriting the code for applicability to the raw information 3. Determine the reliability	1. Reducing the raw information 2. Identifying themes within the sub-samples 3. Comparing themes across sub-samples 4. Creating a code 5. Determine the reliability

(Continued)

Table 3.5 (Continued): Summary of stages and steps in using thematic analysis

Stage	Theory-driven	Prior- research-driven	Data-driven
3	1. Applying the code to the raw information 2. Determine validity 3. Interpreting results	1. Applying the code to the raw information 2. Determine validity 3. Interpreting results	1. Applying the code to the remaining raw information 2. Determine validity 3. Interpreting result

Source: Developed from Boyatzis (1998, p. 44)

Reliability was critical in using thematic analysis (Boyatzis, 1998). Reliability is the consistency in defining metadata about the themes and codes. These metadata included the label, definition of the theme, characteristic description when the theme occurs, description of exemption of the theme, and example of the theme. Converting themes into codes and counting the frequency of occurrences was a way of validating reliability. Good researchers also relied on multiple judges to confirm reliability.

On a more operational level, spreadsheet templates were developed as the forms to help break down the code. The spreadsheet consisted of two forms. The first form was the metadata about the themes. The second form was the coding template. The form appeared in Table 3.6 (a) and (b), respectively.

Table 3.6 (a) was used to record data about theme (theoretical) and sub-theme (categorization) including descriptions about themes. This template was used as a central reference table for all codes generated throughout the entire study.

Table 3.6 (b) was the hermeneutic space for textual analysis (Alvesson & Skoldberg, 2012). The template worked backward from the right column to left column. The steps involving coding were as follows. First, the transcribed portion of text was pasted in the ‘original transcript’ column. Second, the original text was re-summarized into the ‘summarized transcript’ column. Third, key thoughts to come out of the summarized transcript column were intuitively addressed. Fourth, the question

to lead to the answer in the summarized transcript column was put in the ‘question’ column. Themes (theory) and sub-themes (categorization) were mapped.

3.3.2 Meta-routine approach to data analysis

Salvato and Rerup (2011) suggest four steps in performing the analysis of routines as follows: First, breaking routines into sequences of individual actions to understand their evolution and effectiveness; Second, breaking organizational routines into behavioral, cognitive, and emotional components to understand the role of context in routine performance; Third, breaking organizational-level routines across hierarchical levels to understand the role of different individual rationalities in routines performance; Fourth, breaking organizational routines into performative and ostensive parts to understand their role in changing higher-level entities.

Salvato and Rerup's (2011) recommendations matched the exploratory regimes that were derived from the literature review such as agent roles and responsibility, behavioral factors, impact factors, and process and routines extraction and mapping which will be detailed and analyzed in the empirical part of my research study.

Table 3.6: Thematic metadata template (a) and encoding template (b)

Theory #	Theory Name	Category #	Category Name	Description
1.0	Actor Role and responsibility			
		1.1	Role as Interpreter	Performing the role to convey message to multi-disciplinary stakeholders
		1.2	Role as Liaison	Be connected to the right resources and people
		1.3	Role as facilitator	Involvement as a facilitator
		1.4	Common language barrier	Language as a barrier for knowledge and idea transfer
		1.5	Role as Interpreter	Performing the role to convey message to multi-disciplinary stakeholders

*Note: Data appear are an example of theory and category themes.

(a)

ID#	Theory #	Theory Name	Category #	Category Name	Key Question	Key Message	Summarized Transcript	Original transcript
01	1.0	Actor role and responsibility	1.1	Role as interpreter	Is interpretation a necessary skill for the key knowledge champion?	Interpretation is necessary when communicating with multiple persons from multiple disciplines.	Multiple disciplines use multiple languages and require persons with communication skills to get message across.	In communicating with engineer, I have to speak engineering language. The same context but different language is used when communicating with sales.

*Note: Data appear are an example of theory and category themes.

(b)

3.3.3 Developing research trustworthiness and quality of research study

Denzin (2009) wrote a famous article mentioning about "the elephant in the living room" by comparing the emergence of qualitative research to an elephant that is a big animal and exists in the room, but no one wants to mention about. This comes from the dispute between qualitative and quantitative research, where positivists and post-positivists do not accept constructionism as another way to do proper research. The rational of these criticisms relate to the use of interpretivism to draw conclusions, which has an impact on trustworthiness of research findings. Trustworthiness is a major issue in qualitative research, where the quality of research is based on an interpretative practice (Denzin, 2009). It is the researcher's responsibility to develop trustworthiness for the benefits of reviewers and audience.

According to Lincoln and Guba (1985), trustworthiness consists of four values: Truth-value, applicability, consistency, and neutrality. Truth-value establishes the confidence in the truth from the findings. Applicability is the extent where the research findings may extend and be applicable in other contexts. Consistency determines if the research findings can be repeated under the same subject in similar contexts. Neutrality is the degree to which produced findings do not constitute biases, motivations, interests, or perspective of the researcher.

In the development of trustworthiness of qualitative research, there are two operationalized paradigms—validation and reliability (Creswell, 2013). Validation, as defined by Angen (2000) and re-stated by Creswell (2013), is the "judgment of the trustworthiness or goodness of a piece of research" (p. 248). There are two types of validation: ethical validation and substantive validation (Creswell, 2013). Ethical validation is the process of questioning the research agenda regarding the

assumptions, the political and ethical implications, and the treatment of diverse phenomenon. Substantive validation is the understanding of the research findings derived from multiple sources.

Elaborated from Creswell (2013) and Lincoln and Guba (1985), there are eight possible validation strategies that are frequently used by qualitative researchers: (1) Prolonged engagement and persistent observations, to create trust and rapport with participants; (2) Triangulation, to obtain evidences for interpretation from multiple sources. These sources include multiple and different methods, investigators, and theories. Multiple sources imply multiple copies of one type of source, or different sources of the same information. For examples, the interviewing of the same topics from different participants, or review evidences from meeting memos and reports to interpret results in addition to the interviewing; (3) Peer review or debriefing, to check for validation of the results by using external interpreters to help confirm if the same result can be derived. There are multiple benefits of doing peer review or debriefing. First is to show the honesty of the researcher if biases are probed. Second, it provides the opportunity for testing the hypotheses that emerge in the researcher's mind. Third, it provides opportunity for researcher to test the validity of next steps of the methodological design. Finally, it allows the researchers to clear the emotions and feelings that may cloud the good judgments; (4) Negative case analysis, to review the findings using negative or fail case for analysis to identify the disconfirming evidence. This process can be treated as the "process of revising hypotheses with hindsight" (Lincoln & Guba, 1985, p. 309); (5) Clarifying researcher bias, to make the reader understand the stance and position of the researcher. This is to clarify for the possible biases that may arise from the researcher's experiences, prejudices, and

orientations that shape the interpretation and approach of the study; (6) Member checking, to review the collected data, analysis, and interpretative findings through the use of participants' feedback. This is to confirm the creditability and accuracy of the whole research paths and findings. Members are the stakeholders from where data is originally collected. The member group formation can be both formal and informal. Member check can arise daily from the course of investigation as well as from officially conducted review sessions (Lincoln & Guba, 1985); (7) Rich and thick descriptions, to allow readers to make decisions about the transferability of findings. This process allows participants to confirm if the researcher has shown accuracy in transferability (Creswell, 2013); (8) External audit, to allow external consultants or auditors to examine the process, method, and the results if accuracy manifests. The external party should be independent and have no connection to the study (Creswell, 2013).

Another perspective in developing trustworthiness is reliability. According to Lincoln and Guba (1985), there is "no validity without reliability" (p. 316). Reliability often refers to "the stability of responses of multiple coders of data sets" (Creswell, 2013, p. 253). One of the key issues is to determine what code names and code passages are elicited and must be agreed upon with other peer researchers or the stakeholders. Employing good quality recoding media and transcriptions can enhance reliability. The use of computer applications to assist the analyzing and encoding process could increase the quality and, thus, leverage the reliability.

Trustworthiness is important for qualitative research studies. It is about the way to which the research process relates to its reliable evidences. The entire research must be clear, retraceable, and reproducible under the same setting and context. A good

research must contribute four criteria: substantive contribution, aesthetic merit, reflexivity, and impact (Creswell, 2013). Substantive contributions ensure that the research study delivers the understanding of the research focus area and grounded social science perspective. Aesthetic merit demonstrates that the research study is attractive and interesting to interested groups. Reflexivity refers to the idea and genuine interpretative results from the researcher's reflective process. Impact regards the research study contribution to new intellectual insights.

In this research study, I followed the recommendations of Creswell (2013) and Lincoln and Guba (1985) and engaged in prolonged engagement and persistent observation of the research settings which in my case were six different organizations; I triangulated the data collected from individual interviews, in-site observations, and document and artifact review; and I performed peer reviews, which were done after the first draft of findings was written. In particular, I asked a PhD bacalaureate to review my findings providing additional feedback, concerns, and suggestions to improve the clarity of my data representation; negative case analysis, reporting contrasting evidences from collected data; clarification of researcher bias, which I engaged with before I enter the research settings; member checking, asking participants to review their interview transcriptions to provide additional feedback, if any; and use of rich and thick descriptions to ensure the quality of my research finding representation.

Table 3.7 summarizes some of the validity techniques employed in this research study.

Table 3.7: Validity techniques for research trustworthiness

Validation technique (Creswell, 2013)	Apply to this research	Application
Prolong engagement	Yes	Openness and sincerity were achieved from data collection engagement and prolonged time spent in research settings.
Triangulation	Yes	Multiple sources are reviewed and combined to confirm collected information.
Peer review	Yes	Reports are shared and review by a peer for comments.
Negative case analysis	Yes	Upon collecting of data, both successful and failure cases were questioned for comparison.
Clarifying researcher bias	Yes	Researcher stance is informed with expectation to the interviewees, along with the clarifying purpose and the permission to do the study and collect data.
Member checking	Yes	Repetitive questions were asked to multiple interviewees from the same company to validate the truth of the answers.
Rich and thick description	Yes	The individual case study report was submitted to the interviewee for validation and confirmation
External audit	Yes	External proof reading service was used to validate the flow of context and relevancy of findings.

Additionally, the following reliability techniques were applied to ensure clarity, re-traceability, and reproducibility.

Table 3.8: Reliability techniques for research trustworthiness

Reliability technique (Creswell, 2013)	Apply to this research	Application
Substantive contribution	Yes	The focus area and research domain are clear and distinct.
Aesthetic merit	Yes	The research contributes to the literature of absorptive capacity and absorptive capacity meta-routines.
Reflexivity	Yes	Ideas and techniques with interpretation results are revealed step-by-step for traceability and reproduction to achieve the same interpretative logic and results.
Impact	Yes	New insights had been discussed and impact to the study had been demonstrated.

3.3.4 Field data collection

Data for this study was collected from interviews, observations, and documents (i.e., photos, web information, brochures, archived reports, database applications). In-

depth interviews were conducted with multiple levels of employees in six companies. Most of the participants had being employed with the selected companies for a long period of time. Table 3.9 lists the participants of this research study.

Each interview varied in length from 30 minutes to a couple of hours. Interviews were recorded with a digital audio recording device upon consent agreement from the interviewees. Interviews were conducted in Thai. They were transcribed in Thai to preserve the context and avoid possible cause of biases and misinterpretation (Hughes, 2007; Yin, 2014). However, after coding, the relevant parts of the transcripts were translated into English and used as evidence of research findings.

The data collection period was between January and November 2016. In addition to individual interviews, observations of the meetings and public and private documents (such as photos of the workspace environment and information from web sites) were collected.

The reporting of each case used abbreviation of the first letter of the company's name to maintain anonymity. The listing order in the report was sorted by alphabetical order, not the order of interviewing occurrence.

Data were reviewed in the following manner: first, the transcribed interviews were analyzed and stripped into nuggets and sorted; second, documents referred from the interviews, additional information from the company websites and relevant contexts from relevant websites, were reviewed; third, observed meetings that were photographed were analyzed; and last, any field notes taken when visiting each company were reviewed.

The analysis was to define the associate themes and categories. Each case study company had one set of scorecards. Each scorecard contained a step (or stage) of

absorptive capacity meta-routines on each page. All eight stages of absorptive capacity meta-routines were assessed. The summarized categories were used for each of the individual case study reports as the factors that influenced absorptive capacity. These categories were discussed in the report of individual company case studies under the subsidiary question 2 of the research question

Table 3.9: Source of Interviewed Data

Source Company	Type of Company	Years in service	Total number of employees	Triangulation of Data (Number of hours spending)	Executives	Sales Manager	Pre-sales Engineering Manager	Engineering Manager	Others	Total number of interviewees	Remarks
A	Distributor-CCTV	10	35	Individual in-depth interviews (16), Observations (4), documents review (8), field notes (4)	2 (Managing Director and Sales Director)	1	0	1	1 (Engineer)	5	This company is used as a pilot study
B	Distributor-IT Security	12	30	Individual in-depth interviews (8), observations (4), document review (4)	2 (Managing Director and Sales Director)	0	1	1	1 (HR Manager)	5	

(Continue)

Table 3.9 (Continued): Source of Interviewed Data

Source Company	Type of Company	Years in service	Total number of employees	Triangulation of Data (Number of hours spending)	Executives	Sales Manager	Pre-sales Engineering Manager	Engineering Manager	Others	Total number of interviewees	Remarks
C	System Integrator	20	36	Individual in-depth interviews (6), Group interview (2), observations (2), documents review (4)	1	1	1	1	0	4	
D	Consulting-Microsoft Infrastructure	8	5	Group interview (6), documents review (4), observations (4)	1	1	0	1	2 (Standard Compliance Engineer and Microsoft e-mail Specialist)	5	
M	System Integrator-Microsoft Infrastructure	20	28	Individual in-depth interviews (8), Observations (4), documents review (4)	1	1	1	1	1 (Engineer)	5	

(Continued)

Table 3.9 (Continued): Source of Interviewed Data

Source Company	Type of Company	Years in service	Total number of employees	Triangulation of Data (Number of hours spending)	Executives	Sales Manager	Pre-sales Engineering Manager	Engineering Manager	Others	Total number of interviewees	Remarks
T	System Integrator	12	34	Individual in-depth interviews (16), Observation (8), documents review (4), field notes (4)	1	1	1	1	6 (General Manager, HR Manager, Procurement Manager, Document Controller, Project Manager, Engineer)	10	
Total					8	5	4	6	11	34	

3.4 Measurement of success

To perform cross-case analysis, a measurement of success was required. This was to confirm and compare the practice of absorptive capacity among companies for efficiency in knowledge transfer and transformation across the extent boundary of each company. Since the key selection of the case study was purely based on the years of existence in the market of each company, to measure the success, the firm performance that indicates the competitive capability was to be used as the measuring of the success factor.

The measurement was done by two levels. The first level was the comparison between extracted figures from collected data and the figures extracted from the literature review. This gave the indicating figures on which meta-routine elements and the exploratory regimes had been over emphasized or had been less than it should be. There were two techniques to quantify the analyzed data and to compare them with existing literature. The first one was by counting the occurrences of mentioning context regarding each meta-routines or exploratory regimes. The comparison was done in percentage unit as the number of raw collected data depends on various factors from different scales, such as the number of interviewees, the size, the number of employees. The second technique was to give to the occurrences the “weight”. The weight would confirm the level of affirmation. Weighing scales were different between collected data scales and reviewed literature scales. Table 3.10 shows the weighing scales.

Table 3.10: Weighing scale to convert collected evidence to quantifiable value for comparison

Weighing Scale		Meaning
From Collected Data	0	No mention
	1	A passing mention from the data collection
	2	Several mentions from the data collection
	3	Exist as company policy or procedure
From Literature Review Data	0	No evidence found
	1	Single mention
	2	Several mentions
	3	Heavy emphasis

The second level of measurement index was based on the financial performances. These financial performances indicate the level of competitive advantage influenced by absorptive capacity. Cohen and Levinthal (1990) original construct suggested the use of R&D spending as the indicator for the level of absorptive capacity. However, for IT SMEs, R&D has never been in the picture of establishing companies. Financial performances have never been linked to the measure of success of new knowledge absorption in any literature. Table 3.8 lists financial measurements of absorptive capacity "success".

Table 3.11: Financial indicator for success measurement

Category	Measurement Index	Description
Size	Number of employees	Number of employees indicates the size and complexity of knowledge transfer.
	Total assets	Resources allocated for knowledge exploitation.
Growth	Increase in number of employees	Indicate the resource altering for new knowledge absorption.
	Increase in total assets	Indicate the resource altering for new knowledge absorption.

(Continued)

Table 3.11 (Continued): Financial indicator for success measurement

Category	Measurement Index	Description
Financial performance	Total Asset Turnover (times)	Indicates the firm's ability to convert the prepared resources to serve the new absorbed knowledge and turn into commercial. It shows the overall effectiveness of the whole absorption and exploitation process.
	Total Account Receivable Turnover (times)	The ability to execute the new absorbed knowledge. It also an indicator for the customer satisfaction and very much result in customer retention.
	Gross Profit Margin (%)	Measure effectiveness of utilizing knowledge as the products are almost identical in term of high dynamic, high competitive market. The wider margin always means the differentiation a firm made over their competitors.

3.5 Ethical considerations

During the entire research study, I ensured that ethical considerations were taken into account and fully implemented.

Prior to conducting data collection, I received permission from the targeted organizations, requesting approval letters. I discussed the objective and scope of study with the authoritative personnel of the targeted organization in advance, clarifying aims and expectations.

During data collection, I explained the purpose and objective of my study to every participant. Participants were voluntarily willing to take part at the research study, and allowed to withdraw from the data collecting session at any time. Recoding of the session or collection of evidences were informed and authorized prior to the collection of data.

After the collection session, interpretation of results was done in an honest way, including both positive and negative findings. A copy of the study was given to the participative organization and to participants who specifically requested for it. Names of participants, organizations, divisions, and departments were withheld, and all collected information was stored in a password-protected computer.

3.6 Conclusions

In this chapter, I discussed the philosophical assumptions regarding my research study with regards to the constructionism epistemological perspective, reflexive methodology, and multiple case studies method.

I additionally discussed my data collection and analysis processes, including data interpretation, validation, and ethical considerations.

CHAPTER 4

DATA ANALYSIS AND FINDINGS

The purpose of this research was to study how IT SMEs absorbed new external knowledge and how absorptive capacity meta-routines explained this absorption. This research study examined relevant factors, and routines and procedures based on the construct of absorptive capacity meta-routines as defined by Lewin et al. (2011).

4.1 Introduction

This chapter reports the findings to answer the research questions:

RQ: How do IT SMEs absorb new knowledge?

RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?

RQb: What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?

This chapter is organized into three sub-sections: Section 4.2 reports each individual case study and provides a pilot case description (Company A); Section 4.3 discusses the across-case summary and analysis; and Section 4.3 summarizes the findings.

4.2 Multiple Case Studies

4.2.1 Company A Case Study: Pilot Case

Company A was chosen to be the pilot company to verify the framework developed from the Literature Review section. The objective of the verification was to confirm that the absorptive capacity meta-routines framework was valid and could be used as the foundation for exploratory studies of all the remaining cases.

The method to verify the validity of a priori framework was to explore the findings from collected data and compare these findings with the regimes—agent roles, behavioral factors, impact factors, and processes and routines—that were developed from the literatures.

4.2.1.1 Company Background

Company A has been in the closed-circuit television (CCTV) surveillance camera business for 12 years, providing complete importing and distribution services, system implementation and integration services, and operation and maintenance services. The company's eco system starts from dealing for products with overseas product manufacturers, importing them, planning marketing and selling, and educating partners in the company's network. Knowledge flows from external suppliers into the company, circulates around among staff in different departments, and extends across the company border to external partners in its network.

Company A uses three main mechanisms to steer the business: the distribution function, the system integrator (SI) function, and e-commerce. The distribution function performs the importing and distributing of products to the partner network. This function is also concerned with pricing and financial strategy that supports the partners' promotional campaign and financial obligation toward the company's end-

customers. The SI function acts as the channel to interact with high-end customers to reflect the market demands. Because it has to deal in deep technical details with end-customers, SI can be used as the market-testing arena for the distributor. The feedback information will be beneficial, enabling the distribution function to react to market demand and technology trends. E-commerce serves as an additional channel to distribute mass products that require little technical know-how.

The company focuses their business on a single product line. The business revolves around components required for a CCTV system. The company's organization is divided into six major functional areas — Sales, Marketing, Service and Support, Finance and Accounting, Procurement, and Administration and HR.

The Sales function administers the company's selling activities. The function is divided into regions, with a sales manager appointed for each region. Another sales function is telemarketing. Telemarketing uses the telephone to contact the partners without having to conduct face-to-face meetings, unlike the case of the regional salesperson where face-to-face meetings are essential.

The Marketing function deals with partners using media as the channels to communicate i.e., posters, brochures, and event organizing. The marketing team has their own graphic and artwork capability to produce the advertising media.

The Service and Support function is the technical function of the company. Their duty is to perform product screening and testing, and provide aftersales technical support to partners and end-customers.

The company has segregated the partners into three types: Wholesaler, SI, and Installer. Wholesalers buy and stock the product from company A and re-distribute the product to their local partners in the region. SI performs the project installation,

based on end-customer requirements. The Installer does the simple system installation using low-end, uncomplicated, products.

Out of these three, SI requires the most of technical knowledge transfer. The projects where they are dealing with end-customers require complicacy of products with a high degree of interoperability and integrateability with other systems. The Wholesalers need some technical knowledge transfer, as they will have to re-transfer the knowledge to their partnering installers under their own regional network. The Installer requires the least knowledge transfer. The information provided by the datasheet or technical brochure is enough.

The interaction of the company with the three different partner types is different. The SI requires tight coordination from the company. They require close coordination from the planning of the project together, pre-sale approaches to the end-customer, and the after-sale supporting activities. The Wholesaler requires tightest coordination. What they need are beneficial financial terms and discounts from the company so that they can extend the credit terms to their partnering network. The Installers do not require any coordination at all. They just contact the company based on each business transaction. They may interact with the call center for technical support.

The products that the company sells come from three countries; Korea, Taiwan, and China. Korean and Taiwan products are perceived as medium-end and high-end, while Chinese products are considered low-end. The product ranges are suitable for different types of business partners. For SI, only the medium-end and high-end products are considered. The SI customers prefer quality with integrateability to other systems. They usually consider products from either Korea or Taiwan. For Installers, price is the major consideration; not quality. The end-customer does not expect any

complicacy from operating the system, with very little or no integration to other systems. Most of the installations are stand-alone. The Wholesalers do not care much about product quality either. What they want is availability of the products in stock when needed.

4.2.1.2 Primary Research Question

"How do IT SMEs absorb new knowledge?"

Even with focusing on specific products, the Managing Director (MD) of Company A confirmed that there had been a fast movement in this market segment. The CCTV market moves rapidly with new and updated technology:

> "*Last year till this year, technology has changed very fast. The changes happened at the quality of images, the compression technology, and the ability of software to be flexible and integrate-able*" (Managing Director, Thai, Male)

This indicates that the outlook of the CCTV market is a high velocity market. The term high velocity indicates the frequency with which new knowledge is developed. This dictates that keeping employees and the partners' network updated with new knowledge must be done regularly. However, the MD also suggested that technology adoption in Thailand was rather slow and assumed that the underlying reason is from the lack of IT knowledge, as demonstrated in the following statement:

> "*IT in Thailand is slow because the dealer and the end users have limited knowledge of IT" (Managing Director, Thai, Male)*

This statement indicates the gap in knowledge transfer. It also implies that there are multiple levels of knowledge depth involved in the transfer. The challenge of assimilation of new knowledge will depend on efficacy, mean, and methods of knowledge transfer. If this assumption is true, there will be more solid evidences

surfacing during the analysis of data. This assumption will be examined in this chapter. By efficacy, mean, and method, these represent the quality and efficiency of the transfer knowledge, the procedure and channel of the transfer, and how the transfer is done, respectively.

Company A's Managing Director also sees how to react to the newly released technology and bring it into market as a necessary feature to survive in competition. Learning the new technology needs a solid knowledge foundation to support the absorption. The SI function is to service corporate clients with the internal team performing engineering from design and implementation. The SI provides the overall insights of learning. It acts as the solid source of feeding the knowledge back to the company to disseminate to the Wholesaler and Installer functions. The Wholesaler deals with the partners who help them resell their products into regions. The Installer function performs the simple installation of products for ordinary customers where complex knowledge is rarely needed.

Since Company A's distribution channels deal with uncontrollable offshoring partners, knowledge assimilation and exploitation becomes a major challenge to company success. From this organizational arrangement, the transfer of knowledge is not just bounded to the internal team, but expanded to external parties. The assimilation, transformation, and exploitation model need to be explored further since the distinction of the company border is not clear and solid any more (Alin et al., 2011).

Company A's absorption of new knowledge starts from the release of new products from suppliers. New knowledge is transferred to the engineering team and disseminated across the internal boundary to other teams. However, the boundary of

knowledge transfer is not bounded only to the internal network, but also extends across the external physical company border, crossing to the network of partners across the country. Company A, hence, acts as the recipient of knowledge and at the same time the source of knowledge for its partners.

4.2.1.3 Sub-Research Question 1 (RQa)

"How do Absorptive Capacity Meta-routines explain the absorption of new knowledge in IT SMEs?"

Identifying and recognizing value of externally generated knowledge: The absorption process of Company A starts from triggering points to absorb new knowledge. The triggering points come from various sources, such as requirements from the customers, the release of new technology, government regulations, and competitor movements. The most crucial trigger is from the manufacturers and suppliers of products that Company A represents. Company A has recruited a special person, the informant, to gather information when new technology and products are to be released. This person is a resident in the country of manufacture, which in this case is China. The duty of this intermediary person is to inform the company when there is new release of technology and to establish good social connections between the manufacturers and the company.

The process involves the screening and testing of the new product concept and idea before the decision to adopt the new knowledge.

> "*Process starts with my request for an engineer to conduct the test with 1, 2, 3, 4, 5 things to be considered. Test results will be fed back to me in the test report, and sent out by mail to all relevant parties about the test and test results*" (Managing Director, Thai, Male)

However, the above statement indicates that information about the test result is communicated to the relevant team inside the company. This means that Company A addresses the importance of team communications so that when the actual assimilation of knowledge takes place, there will be no surprise.

> "*When we are to launch, if we don't send our engineer to the manufacturing plant, we will have to have the demo set for testing. Testing takes months. We have to become knowledgeable about our products. When we know in depth, we then invite dealers for the training. We use our own engineers to do the training for dealers*" (Sales Director, Thai, Female)

Learning from and with partners, suppliers, customers, and consultants: Company A has strong social relationship with its partners. Once the new product is released, Company A sends their representative to be trained at the manufacturer or supplier offices, or does the training in-house with support of trainers, training documents, and artifacts. From the above statement, it is clearly seen that the activity of transferring knowledge to the rest of the organization, including the entire external partners' network, is to be done by a certain group of engineers. The engineers who are the primary exposers to the new technical knowledge will be the ones to carry on the disseminating process.

Transferring knowledge back to the organization: This stage is very much involved with the preparation of the learning and transferring context to suit the various groups of recipients. The preparation of the transfer is reflected in the following sentence:

> "*The Engineering lead will transfer to their team members first. There are about 5 in their team. Then they will be able to support the Sales team. They*

will later organize course for Sales team. This is called Sales development" (Sales director, Thai, Female)

At this stage, technical knowledge is transferred among the engineering team. While doing internal transfer within the team, feedback is reflected. Once the transfer within engineering is completed, the guiding engineering team prepares the technical knowledge transfer document for the sales and other support teams.

Facilitating variation: The major activity of this stage inside Company A is to communicate with the entire organization. On-site observations indicated that Company A arranges to have weekly meetings every Monday to communicate and exchange ideas and receive responses from every departmental section within the company.

"*Communicating with the sales team has two types, formal and informal. When we have weekly meetings, that is formal. In such a meeting, I have 15 to 20 minutes to present product. If the time is too long, the Sales will not receive it. For informal, the good thing is that the Sales has more willingness to learn. The down side of informal is that they may ignore it*" (Engineering manager, Thai, Male)

The Monday meeting is crucially important as it is a venue to perform sharing and feedback in many upcoming stages of new knowledge absorption.

Internal selection regimes: At this stage, integrated planning processes among engineering, sales, marketing, and other functions occur. Every team prepares their action plan and defines activities to support the organization-wide transfer of knowledge. The activities are reflected in the following statements:

"*Like when we are to launch a new product, and we want a fast penetration to*

the market, then we choose this method. Go out and visit them." (Sales director)

"*We do sell direct, but at a higher price, not the discounted price. This is because, for the end user, we have to know a few things. First, we have to know if this is a bidding competition. Second, if we are to do direct, we have to admit that your dealers will be gone.*" (Sales manager, Thai, Male)

Sharing knowledge and superior practices across the organization: Once the plans are defined and agreed upon, Company A moves into this stage. As mentioned earlier, the boundary of knowledge transfers of Company A involves the multi-disciplinary teams within the company and the partners' network outside the company. Each team is responsible for training the members within the team. Sales teams are also responsible for transferring knowledge to their external partners.

The knowledge transfer documents are developed to help disseminate the knowledge contents:

"*After that we will make the sales tool. This is the datasheet, specification, or even the strong point brochure. The marketing will be responsible for that. It will be delivered to the customers with information about the new product. This tends to be a routine already*." (Sales manager, Thai, Female)

A review of this sales tool document mentioned in the above statement shows that it is used as the basis of the sales activity log to track all future activities and other sales status, including initial sales contact, request for demonstration, bidding, and closing sales. If there are flagging spots that require extra attention, everyone on the team will know and will be able to resolve the unsettled issues and resume the works up to the spot where last left off as indicated in this report.

Reflecting, updating, and replicating: At this stage, Company A is ready to deploy their newly acquired knowledge and push it to the market. The sales team is working closely with the partners to introduce the new product to the market. Every team in Company A is updated with the market response through the Monday meeting venue.

> "*Normally at the end of each project we present the project closing to management, sales, engineers. When during the course of project, we have the progress presentation. Then at the end we present. We have to present all to them. When a problem exists, we cannot figure it out alone. This is the sharing of both success and failure*" (Engineer, Thai, Male)

From the above, it is clearly seen that there are lessons learned from the practice with customers to reflect on good and bad practices. The feedback is disseminated back to the responsible person for responsive actions later. The feedback channel is not just to the departments inside Company A, but also back to the manufacturers or suppliers up the value chain of the eco system.

Managing adaptive tension: At this stage Company A is comparing their operational results with their competitor in the same industry. Competitor analysis is crucial to Company A's business benchmarking, as confirmed in the following:

> "*The competitor analysis is very important. We need the ground to compete…The competitor is to be used as the baseline for comparison. We have to ask why they sell such products and they can sell it*" (Managing Director, Thai, Male)

Company A uses competitor analysis to compare the knowledge, the technology, and the sales activities to evaluate their competitive standpoint.

In relation to the sub-question 1, Company A has a series of activities when absorbing and exploiting the new external knowledge that conforms to the stages of absorptive capacity meta-routines. What is found that differs from Lewin et al.'s (2011) absorptive capacity meta-routines model is that the meta-routines are not just a series of functional elements. They require reflective feedback at every connecting element, and a final loop feedback back to the original source.

4.2.1.4 Sub-Research Question 2 (RQb)

"What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?"

Agent Role: One of the key agent roles is that of the gatekeeper. For Company A, gatekeeper appears as an impact factor at the stages of *identifying the new knowledge*, *the transferring of knowledge back to the organization*, *facilitating variation*, *internal selection*, and *adaptive tension*. Company A is using a gatekeeper to communicate and translate the transformation of the knowledge at the gate where transfer of knowledge moves from one disciplinary party to another.

For internal communication, the gatekeeper is used in the role of coordinator to facilitate the discussion among multiple teams. In the function of the gatekeeper, the person who performs the role becomes the advocate to ensure the knowledge that is in transition from one context to another is being interpreted and understood correctly.

Apart from gatekeeper who oversees the knowledge transfer across disciplines, there is a special function that Company A requires for product manufacturer's connection. This function is the function of an informant. The company had hired this special agent to be working at the manufacturer's site to update the company when a new technology or product is launched to the market:

> "*This person is very good. He is Thai. He can speak 7 languages. I had performed trial and errors for so long [with previous staff]. There are so many Thai-Chinese who speak half Thai half Chinese.*" (Managing Director, Thai, Male)

The informant must have communication capabilities in multiple languages. The multiple language communication is not just bounded to verbal communication, but also inter-context communication across multiple disciplines with multiple contexts. For example, the role of informant is to monitor the technology and know which manufacturer is developing which new technology, as well as knowing the market price and who to deal with commercially on the supplier side.

Another role that is important at the stage of *Identifying and recognizing the value of externally generated knowledge* is the decision maker. This role is performed by the Managing Director of the company. Others may help screening, but the decision to pursue absorption is the sole decision and privilege of the top executive (Managing Director) himself.

When it comes to the stage of *sharing of knowledge across the organization,* empowerment is a necessary factor. At this stage, the transfer requires special action and immediate decision making. The team that is involved with the transfer needs support from management in conducting the transfer activity. Flexibility is necessary. The reason for this is shown in the following statement made by the sales manager:

> "*I have to admit that most of our dealers are not that good. We have to meet with the end users. Even the owners of the company, they may not be so knowledgeable. They leave the presentation part to the end users to us. It's just like I am wearing a different hat, a Sales hat of their companies...They*

will print the name card for us as if we were the sales team of their companies. We just act to be their subordinates, and they are our bosses" (Sales Manager, Thai, Female)

The boundary of knowledge transfer of Company A is not only limited in the internal network, but also expanded across the organization's border to the external, offshoring, partner network. The transfer involves attachment to the sales activities on behalf of the partner. Some upfront agreement with the partner, to help when engaging with customers, is inevitable and the decision sometimes has to be concluded on the spot. Therefore, flexibility through empowerment of decision making is deemed as important.

Behavioral factors: In Company A, communication among different departments is addressed as the primary factor to the success of new knowledge absorption. Using common language in transferring knowledge from outside to inside, from department to department, and from internal to external network of teams is crucially necessary. Conversion of context from one language to Thai would increase efficiency in transferring. All associate documents that support the transfer have to be developed in the local language.

The second most important behavioral factor is the trust relationship among individual employees and among team members. The trust factor has emerged at many stages throughout the entire knowledge absorption process. Company A had made tremendous efforts to build trust among its employees and among departments inside its organization. The effort can be seen in the following statement:

"*I don't talk to everyone all the time, only the Sales that I talk to every week. Before that the communication in the company is always one-way. I just stick*

to the target. But after attending the coaching, we are now discussing more in a positive way" (Managing Director, Thai, Male)

The coaching program is introduced first at the executive and managerial levels, before spreading further down to the operational levels. A review of the coaching training materials shows that the program is about applying positive thinking and respecting one another's functions. The context of the course has been mentioned in the interview by many participants. The result from the training is the constructive communication among employees across the team and organization.

Another behavioral factor that involves building of trust is the no-blaming culture as supported by the following statement:

"*There is no blaming culture. Whole team is responsible. There is no dominating person; the whole team has to go together. This is the way of coaching. I have done this for 3-4 months already. It is a positive way. Before this we blame if the goal cannot be met. I had tried many ways. This is the best way for us*" (Managing Director, Thai, Male)

This practice and approach was demonstrated in the observation of the Monday meeting. Every individual looks at a problem as a challenge rather than finding somebody to blame. The challenge is to overcome the problematic issue together. The discussion in the meeting indicated that everyone from different departments was trying to find the right action from their perspective when a problem arose.

When discussing the rewards for successful knowledge transfer and absorption, the following statement portrayed what happens in the organization:

"*We pick out the successes of our team, who accomplished the target. We appraise them with performance indicators. We give out awards. Sometimes*

it's money. The most basic is to give applause" (Managing Director, Thai, Male)

The monetary rewards given to support the activities are not of great value. Mostly, the Monday meeting is used as the venue to praise the key success and the person who performs.

At the stage of *facilitating variation*, three factors came up. These are the socio-psychological barrier at the group level, building a shared vision, and leadership style. The socio-psychological factor relates to the no-blaming culture; building the no-blaming culture overcomes the socio-psychological barrier. This encourages the team to open and share. Building a shared vision and leadership style are the associate outcomes of the coaching class. The executives of Company A emphasize creating a shared vision to ensure their employees know where the company is heading, and they put this into practice so the employees can follow.

At the stage of *internal selection regime,* the knowledge sharing culture is fundamental to and drives success at this stage. As can be seen from the following statement, the knowledge sharing culture has been embedded into the working procedure:

"*When you are talking to your customers, there is some information that you have to fill in on the Sales-Customer meeting report form. There is certain information that is required. This information will be fed to Marketing. Then Marketing puts the required information in the form. For example, for your contacted customers, how many LINE ID do they have and have not, how many e-mail accounts do they have and have not, etc. If you don't fill in this information, Marketing will keep asking. It's mandatory to have all the*

information they need" (Sales manager, Thai, Female)

A knowledge sharing culture is built through the use of internal meetings. The effective means and methods are shared from one team to another. With this culture, the assimilating of knowledge, the transforming of knowledge and the result of implementing such knowledge are learned and shared across the organization with ease.

Considering the overall perspective of absorptive capacity under the behavioral factors, building of trust is the key dominant factor that encourages the absorption of new knowledge. Trust is built through multiple cultural factors, including the no-blaming culture, the dependability on others, and the knowledge sharing and learning culture. These cultural factors are embedded deeply into the core of Company A.

Impact Factors: Certain impacting factors exist throughout the entire absorption process of Company A. Social relationships are the most important factor for all the absorptive capacity meta-routines. This was indicated in the following statement regarding dealing with new suppliers, partners, or customers:

"*I didn't know them before. This project is the first time that we worked together. After a while we gained the understanding and built the relationship. They are willing to share. This is because we have a clear target to deliver the work on time" (Engineer, Thai, Male)*

"Strong personal relationships play dominant roles in approaching and winning a project" (Managing Director, Thai, Male)

The second most crucial impact factor on the meta-routines is the existing structure of cognitive knowledge traits. If the existing traits match with the core foundation to the new knowledge, the absorption can be done at a high pace with ease.

"*Before deciding to adopt new things to our main line we have to explore. We have a lab to let our engineers play around with. This is how we survive. It's an enhancing process from what we already know. Just extend it a bit to grab the new technology*" (Managing Director, Thai, Male)

According to the above statement, the new knowledge has to be built on top of the existing knowledge. The stronger the existing level, the easier the absorption can happen. And when considering the assimilation of new knowledge into the rest of the existing network, the following statement shows a clear indication of the impact on the factor of knowledge traits:

"*When we do an event, we have to specify the group of customers. The customers have to be the same type. For example, when we do the basic training, we do not mix the knowledgeable customer with the beginners. Otherwise it will bore the advanced customer why we have to go over the fundamental detail. So, the invitation has to be classified*" (Sales manager, Thai, Female)

For the transfer of knowledge to be effective, segregation of customers of different levels has to be arranged. Without segregation, the transfer would risk being unsuccessful. Results must be segregated to prepare the right document with the right context to fit with each type of recipient.

The third factor that has impact on the transfer of knowledge is collaboration, which leads to a collaborative work environment and the use of assistive technology. A collaborative work environment means the use of open workspace to easily and effectively communicate among members of the team. A collaborative work environment becomes effective at the stage of facilitation variation. At this stage,

exploratory learning from the lab experiment allows the engineer to share upfront information among the team. Once a new discovery is found, the engineers gather themselves together to learn immediately. This type of work environment is suitable for informal knowledge transfer.

The means of transfer can use technology to assist the transfer process. The use of technology to transfer knowledge occurs at almost every stage of absorptive capacity. Technology like chat application and e-mail helps reduce the gap in verbal communication. Communication with pictures and texts has been proven to cause less ambiguity among individuals. The indicative evidence is shown in the following sentence:

> "*We use LINE [a smartphone chat application] to talk to our customers and with other departments within our organization. We don't have to explain much, just take a snapshot photo and send. LINE and e-mail are two of the most crucial tools that we use to decrease the verbal communication. It has the capability of verbal, plus the capability to show what we are talking about using photos*" (Sales manager, Thai, Female)

The last factor that raises awareness of information leakage is the knowledge spillover. This factor occurs at the stage of sharing knowledge and superior practice across the organization.

> "*Before that, we approach them at their region. We went to the south and invited everyone in the south to join. We do not get the quality, but only the sales activities. We do this to all the regions. When we go, all related dealers come. Our competitors also come. We cannot control or focus*" (Managing Director, Thai, Male)

As stated by the managing director of Company A, knowledge spillover is the negative force that hinders knowledge transfer. Spillover can cause the disclosure of valuable information to the competitor. As the Company A partnership network spans outside the organization, the disclosure of information becomes uncontrollable. This kind of fear factor shapes how Company A conducts their sales and marketing activity. Company A decides to disclose the sensitive information to their trusted partner only by inviting them to the support sales activity to be organized at their office, while the general information release activities may take place at the partners' regional locations.

For impact factors regimes, the factors play important roles. Social relationships, existing knowledge structure of cognitive traits, collaboration, assistive technology, and knowledge spillover impact the entire absorptive capacity meta-routines.

Procedure and routines: Procedure and routines is the last regime to explore. At the stage of *identifying and recognizing the value of externally generated knowledge*, the procedures of knowledge triggering, exploring technical context and testing, and decision-making play roles.

When moving into the second stage of *learning and supporting from and with partners, suppliers, customers, and consultants*, the arrangements to have formal knowledge transfer and the deep technical knowledge exploration are organized.

At the third stage of *transferring knowledge back to the organization*, the procedures to re-train other teams and the development of knowledge transfer documentation are involved.

At the fourth stage of *facilitation variation*, the procedure to communicate throughout the organization is prepared.

At the fifth stage of *internal selection*, procedures to perform the planning are developed. At this stage, some analyses, such as marketing analysis, partner screening, and small scale pilot test are conducted.

At the sixth stage of *sharing knowledge and superior practices across the organization*, tools and routines to transfer are developed. Communication materials such as marketing documents and technical documents are developed for the entire organization transfer.

At the seventh stage of *reflecting, updating, and replicating*, the event to organize knowledge sharing and the reflecting of the sharing and implementing of new knowledge are involved. Feedback of the results of sharing and practice are delivered to the involved persons to complete the learning loop.

And for the last stage of *managing adaptive tension*, the routine to compare and benchmark with the competitors are conducted, as well as the market and sales forecasting to confirm the outcome of utilizing the new knowledge.

4.2.2 Company B Case Study

4.2.2.1 Company Background

Company B has been in business for longer than 12 years. Company B is classified as an IT product distributor. The company has restricted its business domain to the supply of IT security products and services. Company B operates through partners in distributing, installing, and configuring the products for the end customers. However, the company provides the back-end support and when the matter requires deep IT security support, the company engineering team will assist the partners to solve problems and provide commissioning to close out the project.

Defining itself as an IT product distributor, the company has direct contact with the manufacturer at the country of origin. The company has to import the product and obtain knowledge transfer in order to perform commercialization in the country. This means that the company faces the intensive direct knowledge transfer right from the source and relays the knowledge to its partner channels.

The company employs more than 30 personnel. The organization is divided into 5 departments—Engineering, Presales Engineering, Sales and Marketing, HR, and Accounting and Administration.

In terms of required knowledge, the engineering team of Company B mandates that employees have certification on network security. The company's recruitment website shows clearly that possession of these certifications is a *laissez passer* for a career with the company. Knowledge obtained from these authorized certifications has become the common knowledge traits to perform the job, and is the foundation for new knowledge absorption. For other positions, like Sales, the fundamental knowledge of an IT network is mandatory. This equips the staff with the knowledge foundation that aids the transfer between Engineering and Sales.

4.2.2.2 Primary Research Question

"How do IT SMEs absorb new knowledge?"

Company B's strategic direction is to be the early adopter in IT security. With this direction, the company has to intensively follow the IT security technology and market trend. The company has to know the most up to date security threats and the counter measures before any other companies. With the enormous number of emerging security threats occurring every day around the world, there are huge amounts of new external knowledge to be absorbed into the company.

The strategy to become an IT Security early adopter is reflected in the product selection and time to market. According to the Company B Managing Director:

> "*People always say that our company always sells new products that are not available in Thailand market, the product that is not in the main stream and very few people have heard before. I wish to say that before paving into the market, I have done research. I have spent a tremendous amount of time to do the research*" (Managing Director, Thai, Male)

From the above statement, Company B is not just selling a product; they also have to educate the market about the new threat and how to cope with that threat with new functions and features. To do this, Company B has to learn and update their knowledge at all time. From the acquired knowledge, the company must also assimilate, transform and apply the knowledge into commercial gains and competitive advantage over its counterpart rivals, as well as educate their partners and the market.

4.2.2.3 Sub-Research Question1 (RQa)

"How do Absorptive Capacity Meta-routines explain the absorption of new knowledge in IT SMEs?"

Identifying and recognizing value of externally generated knowledge: Company B begins the stage of new knowledge identification from emerging threats to IT security. Such events trigger the need to update new knowledge.

The second trigger comes from compliance requirements. Compliance is either because of the requirement of a customer's company to comply with best practices, or because of government regulations. These two triggers raise the demand on the customer side to look for IT security solutions.

Learning from and with partners, suppliers, customers, and consultants: For new technical knowledge, the product supplier organizes a visit to the company to transfer the knowledge. An introductory session is arranged by the supplier engineer to provide the foundation technological knowledge. The formal class room instructor-led session will later follow with hands-on experience transfer using a prototype machine. The official training will not just build up the knowledge for Company B's engineering team, but also develop the relationship between the supplier's team and the company's team.

Transferring knowledge back to the organization: According to organizational design which is based on functional form (De Boer et al., 1999), the engineering team and the presales team will be at the forefront to learn from suppliers.

Facilitating variation: According to the Managing Director, certain engineers are designated to take full responsibility for two to three products. These engineers will take on the certification qualification process to ensure they can represent the products according to the suppliers' requirements:

> "*We have responsible engineers who will take care of two to three products. These engineers will be responsible to learn from the product owner, and will be certified according to the requirement from the supplier*" (Managing Director, Thai, Male)

Internal Selection Regimes: This is not clear since the selection is done by the Managing Director himself. While the selection process has been defined earlier in the Identification stage, there are disagreements between the Managing Director and the Sales Director regarding the market possibilities:

> "*I base my decision on technical perspectives. There are some cases that the Sales Director agrees with me on the possibility of commercializing the new product. In my perspective, I always thought there was a technical gap that the market needed to secure their boundary. However, she [Marketing Director] is not the type to stand resisting. I always am dominant, which sometimes is not good*" (Managing Director, Thai, Male)

Sharing knowledge and superior practices across the organization: The transfer of technical knowledge is from the engineering or presales engineering team to other teams, especially the Sales team. Transfer happens internally using simple plain language. At this stage, sales and the engineering co-develop the transfer document as they will have to later transfer to the partners and educate their customers.

Reflecting, updating, and replicating: Since the strategic direction of Company B is to be the early adopter of technology, the commercialization of the product requires educating the market. Thus, educating the market is a part of Company B activities:

> "*Our duty is to educate our customers and our market. We must not withhold any knowledge. We must transfer knowledge and know-how and we must keep doing it. It is like we are pitching for the job. We must keep doing it. At the end, people will look at what we have. If this answers their questions, then I can close the sales*" (Managing Director, Thai, Male)

Educating the customers and market comes in many forms. Company B uses events to introduce products to market, and uses small group training sessions to explore and transfer more in-depth technical knowledge.

In order to reflect on the successful adoption of knowledge, Company B arranges to have weekly meetings for feedback. In this venue, the Sales team who work

directly with the customers and corresponds with the market provides feedback to the Engineering and Presales Engineering teams. The exchanges happen freely. Facts from both sides are exchanged so that Sales can respond to the customers with the technical perspective and Engineering can learn how the commercial sector reacts and what the main issues are.

Managing adaptive tension: Educating the market has dual side effects. The positive effect is to build awareness about the security threat. The negative is that the customer may end up buying other solutions from a competitor. It is Company B's obligation to transfer the knowledge to the market, without fear of knowledge spillover. Awareness of threats is more important than making sales. However, Company B has the sessions to follow up and learn from what happens. This internal sharing is very crucial in that it helps the teams learn and receive benchmark results.

4.2.2.4 Sub-Research Question 2 (RQb)

*"*What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?*"*

Agent Roles: The primary role is the role of Decision Maker in product/knowledge selection. The Managing Director of Company B solely takes this role through the entire knowledge absorption process. Some disagreements and discussions on commercialization and capability development of employees may occur during this process, the function of decision making is still dominated by this top executive:

> "*I am the sole person to do product selection. Before doing this, I need information from the Sales. This information comes from our customers*"
>
> (Managing Director, Thai, Male)

The second role that occurs throughout knowledge transfer during the absorption process is the Gatekeeper/Translator. This role is mainly performed by the Engineer or Presales Engineer. These two perform as the front line for the technical knowledge transfer from the product suppliers. After the transfer, they will have to re-transfer to the rest of the organization. English and technical jargon are the major barriers of the transfer between knowledge disciplines. The two individuals have to use interpretation and plain language communication to ensure understanding and the correct transfer context to the recipients:

> "*Mainly I have to do the translation as my team sometimes is not comfortable with English*" (Managing Director, Thai, Male)

The transfer does not just occur internally among employees, but also extends to the partners and customers. Development of reference documents or training materials also falls to the Engineering, Presales Engineering, and the Sales teams to co-develop the context.

Behavioral Factors: The first factor concerning the absorption of knowledge is with the knowledge transfer process. This factor is the fear of asking questions in public. This psychological factor is the norm among Thai employees. As confirmed by the Managing Director:

> "*It's the habit of Thai persons when they are with a small, familiar, group they tend to be more open. But when they are in the larger discussion group, they seem to hold back and become silent" and "Thai people are not like Americans. Americans, when they are in doubt, they fire questions right away. For the nature of a Thai person, even when they are in doubt, they will not*

ask. I'm not sure if they are shy or do not want to lose face" (Managing Director, Thai, Male)

This habit impacts how the company organizes the knowledge transfer session. Starting from the self-preparation for the transfer, engineers seem to prefer the self-pace learning via electronic media; for example, e-learning materials prepared by the suppliers. According to the Presales Engineer and Engineering Manager:

"*I prefer to prepare myself by doing the self-development. Learning is my passion and I can say it's the passion of everyone in this company*" (Presales Engineer, Thai, Male)

"*Everyone here has to develop his own skill. He must be mature then when in the university. He must carry on self-learning*" (Engineering Manager, Thai, Male)

Apart from self-learning, the size of the knowledge transfer session also matters. As confirmed by Engineering Manager and Sales Director:

"*The session size of about 30 people is just about right. With this size, the communication goes through easily from management team to the working team, from the top to the bottom. This gives us the warm feeling, not like in a bigger class*" (Engineering Manager, Thai, Male)

"*When we organize knowledge sharing and transfer with customers, the smaller group allows us to learn from the customers what they wish for and we can exchange how we can help them*" (Sales Director, Thai, Female)

Another behavioral factor that was addressed as important to the learning in Company B is the Learning Mindset. This Mindset is derived from the company's

values which the Managing Director acts out and tries to implant into the culture of the company:

> "*My father taught me three things—Goodwill, Punctuality, and Integrity. These three words are the foundations that build everyone in this company. If we can do these three things, we will be successful in terms of business*" (Managing Director, Thai, Male)

Company B three core values are Goodwill, Punctuality and Integrity. The Managing Director always tells his employees to derive their values from these three words by expressing them in terms of Service Mind, Attitude, and Continuous Learning:

> "*I always tell my team to have a service mind. We do not look at the profit as our prime target. We have the attitude to be a contributor, rather than a taker. The customer will realize that we are not here just to sell and make money. We are here to give what is best for your organization"* and *"Since we are exposed to learning environment at all time, we continuously upgrade ourselves and can respond faster to the security threat*" (Managing Director, Thai, Male)

Another factor that was mentioned as a concern is the Fear of Knowledge Spillover. This factor occurs because the company, as a distributor, is involved with introducing new products to the market. Sometimes the knowledge of the new functions, features, or security threat prevention is not widely spread. Educating the market involves the sharing of knowledge. By doing so, the competitors can map the new knowledge and use it to benefit their competitive advantage. Fear of this possibility may result in knowledge hoarding. However, sharing knowledge results in

trust building with the customers and increases awareness of the new threat and the counter measures to prevent the damage, which is beneficial for the entire ecology.

Impact Factor: This factor pertaining to the Identification of the new knowledge for Company B starts from the triggering points for IT Security product distributor. These are the emerging threats of new kinds of attack, government regulations, standard compliance requirements, and demand from customers. These triggering points cause the Managing Director of Company B to make decisions on product selection.

Once the decision is made, the important factor that impacts the quality of the transfer of knowledge is the explorative learning from the Prototype, or so called 'demo set', as confirmed by the Managing Director and Engineering Manager:

> "*I have the demo box of every product that I am selling. As you can see all of them lie around in my office. Demo set is important for learning. My engineers, after training, need to have an actual hands-on lab. This is a confirmation process that you can go out and support customers*" (Managing Director, Thai, Male)
>
> "*I set up the lab with the prototype set. This is to ensure that we have tested all the functions before going out and seeing customers*" (Engineering Manager, Thai, Male)

During the preparation step for internal knowledge transfer, the dominating factor that has impact on the efficiency of the transfer is the language. Language can be treated as a barrier, especially English, as the Thai engineers and staff in other disciplines are not proficient in English. At this stage, simple language must be used with translation, interpretation, and especially conducted by a dedicated person acting

as gatekeeper. English Literacy is a requirement when recruiting. However, even with this capability there are still Language problems that prevent the knowledge transfer efficiency.

At the stage of preparation and resource allocation, another factor that was mentioned is the Time to Educate Market. Time is required for the market to learn and adopt. As mentioned by the Sales Director:

> "*There are some products to which the market is not yet ready to respond. For example, one is the DLP solution. We have educated the market during the past 5 years. The market has just opened and started to respond to this technology*" and "*Sometimes we have to wait. Pushing the market requires financial investment. The return may come back in years later. This is the risk*" (Sales Director, Thai, Female)

During the stage of knowledge transferring to other teams or to the customers, a factor that has impact is knowing the recipient. It is very important to understand the recipient and their culture. Before the transfer, it is important to put yourself into the shoes of the customers and think about the difficulties involved with their knowledge absorption. These factors are confirmed by the statements from the Sales Director and Managing Director as follows:

> "*Knowing a customer's culture is very important. We have to know how their culture works. If we can match their culture, we can understand what they like and how they make decisions. If we have this understanding, we can make the sales. That is why we have to have our Sales Representatives visit our customers so often*" (Sales Director, Thai, Female)

"*How to approach a customer is very important. We have to look at them and think what they should be like. You should put yourself as a customer and think of what your customer wants to hear*" (Managing Director, Thai, Male)

From the above statement, putting yourself in the position of customers and designing the knowledge transfer approach from that viewpoint is crucial. This understanding comes from the Social Relationship between the Sales and the customers. Thus, this is another important factor.

The final reflection on the transfer of knowledge is obtained through feedback. Learning from multiple disciplines regarding the knowledge transfer helps the company to review the result and the efficiency of the transfer and also to do a competitor analysis at the same time.

In order to make an effective evaluation, Measurement Indexes of the results of expectations is very important. As mentioned by Managing Director and Presales Engineer:

"*The money that a customer pays us must be worth it. This reflects in the call back from a customer. Sometimes when they have questions, they will think of me first. This is a good indicator*" (Managing Director, Thai, Male)

"*When we do a competitor analysis, the information available in the public is what we refer to. Sometimes the information is available only through the internal network of engineers. These engineers are friends who we are so familiar with. And the information is in-depth information*" (Presales Engineer, Thai, Make)

From the above statements, the measurement indexes are the Customer Loyalty and the Social Relationship on Professional Network ties among the engineering

group of friends who share knowledge. Customer loyalty can be measured in the repetitive purchase or the frequency of points of contact. The relationship among peers in the professional network can be measured by openness and sincerity as well as by frequency of knowledge sharing in the network.

Process and Routines: The key factor that has impact on process and routines is the Quality Assurance process. According to the Engineering Manager:

> "The *Managing Director had done research on features and functions. It is the engineering team's job to ensure the features and functions of the product that we are to sell can do what it is supposed to do*" (Engineering Manager, Thai, Male)

One element of the quality assurance process is the Simulation. The simulation process takes place to demonstrate to the customer that the product can perform as it should. In IT security, to demonstrate this functionality, the simulation of an actual threat is required. A closed environmental lab test has to be set up.

4.2.3 Company C Case Study

4.2.3.1 Company Background

Company C has been in the market for more than 20 years. The company positions itself as an IT Solution Integrator, or SI, offering products and implementation services in the range of IT Network, IT security, server and data storage, and voice and video communication solutions. From the business ecosystem standpoint, they have local distributors as their upstream supply chain and customers on the end stream. Sometimes, they contact directly with international product suppliers to import IT solutions to serve the needs of their customers, bypassing the normal IT distribution channels.

Company C employs more than 30 staff. Their organizational structure is simple. They have an engineering department responsible for delivering technical works to the customers, the sales department responsible for all sales activities, the pre-sales engineering department who assist the sales department with a technical perspective when closing sales, and back-office support which consists of the administration and accounting departments.

Two directors run the company. The Managing Director takes the responsibility for keeping the business going. He directs all the sales and the internal management, including Human Resources, Accounting, procurement, etc. The Technical Director is responsible for engineering and new product development, including decision making on technology adoption.

4.2.3.2 Primary Research Question (RQ)

"How do IT SMEs absorb new knowledge?"

Company C buys IT products from their suppliers to perform installation, configuration, and aftersales maintenance services for their clients. The technical and commercial knowledge are transferred from their distributing partners. The strategy of Company C is to focus on certain customers as indicated in the following statement:

> "*Focusing on the customer, not the product, is the key to doing bu*siness"
>
> (Managing Director, Thai, Male)

This means that the knowledge to be absorbed by the company is based on the requirements of each specific industry the customer is in. Focusing on the customer's industry results in developing specific knowledge, making Company C into a niche IT solution provider of that industry.

With this customer focusing strategy, Company C has arranged their organizational structure using small team units that can freely react to the needs of customers in each industry segment.

> "*The company had tried several models of organizational structure from vertical market to industrial segregation. Finally, it ends up as the mix of product knowledge in every team that supports industrial segregation*"
>
> (Managing Director, Thai, Male)

From the above statement, the organisation of the company into small groups of multidisciplinary team members requires empowerment of decision making. This empowerment means the team can make decisions on their own to better support the customer. The team can contact the upstream supplier for product clarification and request special pricing and actions.

In terms of knowledge absorption, each team has to assimilate and transform the knowledge within its own small group. This raises another question as to whether absorptive capacity is the property of the organizational level, or an iteration of a smaller group within an organization. However, for Company C, while the small group has freedom to act on its own, many supportive actions come from the remainder of the organization beyond the group, and the results of actions are transferred to the rest of the organization as well.

4.2.3.3 Sub-Research Question 1 (RQa)

"How do Absorptive Capacity Meta-routines explain the absorption of new knowledge in Thai SMEs?"

Identifying and recognizing value of externally generated knowledge: Company C begins the stage of new knowledge identification from the customer focus strategy.

The trigger comes from the customer when they express their needs for new product or service. The decision to absorb the new knowledge comes from the technical and managing director as shown in the following statement:

> "*I am the one who makes the decision. Actually, there is the Technical Director who supports me in making that decision. I am responsible for all financial and sales, while my technical partner is responsible for the technical selection*" (Managing Director, Thai, Male)

A two-person committee performs the knowledge screening. The factors impacting the decision are the demand from customer, the possibility to expand sales to other customers or markets, and the technical capability for the support team. Once the decision is made on the new knowledge to absorb, communication with other teams begins.

Learning from and with partners, suppliers, customers, and consultants: At this stage, the engineering manager contacts the product suppliers, who will provide the transfer of both technical and commercial knowledge. Transfers are in the form of formal and informal, instructor-led or self-study, with the contents of the training provided on web media.

Support from suppliers begins when there is the potential for buying. According to the following statement:

> "*Our supplier will fly in when we are asked by the customer to conduct the Proof of Concept (PoC). Before we arrive at this stage, we have been in close contact and exchange information with our customer. We have enough information to clearly identify what our customer really needs. Our engineers*

will learn and match the needs with our solution" (Post-sales Engineering Manager, Thai, Male)

When a certain stage of customer engagement is reached, the supplier will play an important role in knowledge transfer. At this time, the transfer becomes formal. All resources regarding the transfer will be supported.

Transferring knowledge back to the organization: At this stage, knowledge begins to transfer into the organization. Teams that are involved with the new product and new knowledge will be the targeted recipients. According to the Sales Manager, the transfer requires special aids from some specific work functions to help with understanding during the transfer:

"*I have a problem understanding technical issue sometimes, but I ask the pre-sales team to help explain it to me*" (Sales Manager, Thai, Male)

The person who is in the presales function is the one with an engineering background but who prefers going out and meeting customers. Company C uses presales as the gatekeeper in transferring knowledge from the supplier to the engineering and sales teams.

Facilitating variation: Once the knowledge has been transferred from the supplier to the involved teams, the leader of each team will assign specific tasks to suit each member of the team. As mentioned in the previous section, the team is composed of team members from various disciplines. The assigned team members will perform the knowledge sharing with others inside the company who are in the same working discipline:

"*For newly acquired knowledge, the starter takes all responsibility from picking up the team, ensuring knowledge gest assembled, ensuring the transfer and ensuring it gets implemented*" (Managing director, Thai, Male)

During the team's existence, every team member will have the full responsibility for carrying, expanding, and implementing the new knowledge to work. The team will exist until the project has been concluded. Then the team will be dissolved.

Internal selection regimes: This stage of meta-routines is not clearly identifiable for Company C. The selection of the team and the selection of knowledge to absorb has already been explicitly made by the Managing Director and the Technical Director during the early phase of the first stage. This case is an exception to the meta-routines since the decision usually made at this stage has already been made during the identification phase by the top executives of the organization.

Sharing knowledge and superior practices across the organization: Sharing of knowledge across the organization is carried out by the responsible individual of each discipline who is involved in the small team project. Cross-discipline sharing also occurs from time to time, but not on regular basis:

"*There is internal knowledge transfer from Engineering to Sales but not on a regular basis*" (Managing Director, Thai, Male)

This results from the internal cross-disciplinary sharing that occurs in the smaller ad-hoc project team with tight coordination among team members. Once the transfer occurs, the team member who shares the same discipline will take responsibility to transfer to others in the same discipline outside the team.

Reflecting, updating, and replicating: Training carried out internally involves the development of knowledge transfer documents. These self-development documents

are also shared with the upstream supplier. The sharing back is through social relations channels. There is some evidence that these documents are beneficial to the business eco system; enough for the supplier to ask Company C's assistant to share these lessons with others in the business network outside the organization:

> "*The knowledge transfer is done internally. Sometimes the supplier requests the reflecting of learned knowledge, so they request the team to present to them*" (Managing Director, Thai, Male)

Managing adaptive Tension: According to the Sales Manager, the performance of the project and the team is continuously monitored and analyzed on the fly:

> "*If there is any sign of missing the target, I will come and discuss with my team what issue we are facing and why we are missing the target. I will support them if they need more training or if they need me to help meeting with the customer*" (Sales Manager, Thai, Male)

From the above statement, it can be inferred that empowerment of decision making by the team leader yields the benefit of flexibility of decisive actions to rapidly respond to the problem. The team has the freedom to move which will improve the utilization of the new knowledge in execution. The result is measured in the customer satisfaction feedback and customer retention by the company as stated in the following statement from Managing Director:

> "*The ability to retain knowledge and relationships results in retaining the customers. The existing customer ratio consists of 90% remaining old customers, with only 10% addition each year*" (Managing Director, Thai, Male)

In relation to Sub-question 1, Company C has routines that conform with Lewin et al.'s (2011) absorptive capacity meta-routines, but not in the sequential order as defined. Some variations occur at the stages of *Internal Selection Regime* and *Sharing knowledge and superior practices across the organization*. The variation results from the early stage decision-making process by the top executives concerning knowledge absorption, which results in the process of internal selection being omitted. The second variation is in the sharing across the organization. While this process occurs, it is within the same discipline of knowledge. This is due to the organizational structure with the formulation of the ad-hoc team to handle the new knowledge in the early stage of knowledge absorption. With empowerment to the small team, the transfer of knowledge across disciplines occurs among the tightly related team members. The sharing across multiple disciplines occurs here. The transfer outside of the team is to people in the same discipline.

As confirmed by the presales engineering manager and the post-sales engineering manager, the transfer of knowledge into the company does not occur in a sequential manner, but rather is bidirectional between the presales and the post-sales teams. In addition, the transfer also occurs across the company boundary to the customers as well:

> "*Before arrival to the PoC [Proof of Concept] stage, the Presale team will design the solution and share knowledge with the customer*" (Presales Engineering Manager, Thai, Male)
>
> "*After realizing that the customer has strong interest in our solution, the Post-sales team will step in and learn what Presales has committed to the*

customers and whether the customer really has the right solution that fits their needs" (Post-sales Engineering Manager, Thai, Male)

At this transfer stage, the learning occurs in a tri-partied fashion among Presales, Post-sales, and customers. Feedback dynamically occurs at this stage.

4.2.3.4 Sub-Research Question 2(RQb)

"What factors contribute to the successful or unsuccessful absorption of new knowledge in Thai SMEs?"

Agent Roles: The first factor under the Agent Roles regime is the knowledge transfer role. The roles consist of four sub-roles—external-inward transfer, the intra-team transfer, internal-outward transfer, and external-revert transfer. Company C breaks down the transfer process in the early stage of adoption by formulating a small team from multiple disciplines to handle the transfer. According to De Boer et al. (1999), this form of organizational arrangement is called the divisional form. The external-inward transfer is conducted by the product supplier to the team leader and team members directly. Having a smaller team to handle the first-hand knowledge eliminates the complexity of using the gatekeeper to assist in various stages of the transfer. Cross-disciplinary intra-team transfer also occurs inside the team. The internal-outward transfer of knowledge to others outside the team within the organization is done by the member of the team working in the same discipline as personnel outside the team. However, sometimes there is a special request from suppliers to revert the transfer. The team leader then performs the role of external-revert transfer of knowledge back to the supplier, or sometimes to the eco-system of the supply chain.

The second factor in the agent role regime is the gatekeeper role. This role is used in transferring and translating the contents from one common context to another. This role is initially performed by the team leader to aid the transfer from external supplier to the multi-disciplinary team member. Then each team will act as the gatekeeper to help the transfer to others outside the team in the same discipline.

The third factor that is important in the identification and internal selection stages is the Decision Maker role. This role is performed by the Managing Director and Technical Director of the Company C. Once the decision is made for new knowledge absorption, it will be the final decision during the Internal Selection regime stage.

Behavioral Factor: When raising the question of behavioral factors in the interviews, KPI was mentioned a few times in relation to motivational impact. The response was contradictory. KPI indeed is increasing stress and has never been used as a motivator to new knowledge absorption:

> "*There is no KPI, there will never be. We use a result-oriented approach to get things done."* and *"Commission is the incentive to make sales, but missing target does not result in dismissal from the company*" (Managing Director, Male, Thai)
>
> "*KPI is not enforced here but we have the target to meet. There's no penalty but missing the cut will impact the bonus at year end*" (Sales Manager, Male, Thai)

The company does not use KPI to measure success or failure in transforming knowledge to enhance the competitive advantage. KPI in the company is considered a demotivational factor as it increases stress over the employees. The result of actions is instead considered as the key measure of success.

A walk around the workspaces of Company C shows many pictorials with words to motivate such as “Working Together”, “Winners”, “Possibilities”, “Success”, and “Challenge”. These words are embedded into the work life of employees and become the core values.

Impact Factor: The factor that has direct impact on the decision making of Company C on whether to absorb new knowledge is the demand originating from the customer:

> “*Focusing on the customer builds network connections and allows shaping of product directions to serve their needs*” (Managing Director, Thai, Male)

The customer needs are powerful enough to shape Company C’s organizational structure, which is adjusted according to these external needs. Suppliers will also be informed and asked to respond to the needs. After a thorough study of the customers’ needs and discussions between the commercial and technical directors, the decision will be made whether the new knowledge has the potential to support other customers in the industry or in the market.

Above all, the final decision making of whether to absorb the new knowledge depends on the Capacity Fit factor. As shown in the following statement by the Sales Manager, the support team will be the final frontier to deliver the quality of service to the customers. If the support team do not have the necessary knowledge or do not have enough manpower resource, the absorption and transformation of new knowledge with guaranteed quality will not take place. This means if the existing capacity of the support team does not fit with the new knowledge, then the absorption will fail:

> "*Support will be the one who made a final selection from the original screening. They will use technical reasoning to support their decision based on the ease of support, complicacy of system, the ease of configuring, etc.*" (Sales Manager, Thai, Male)

Another factor that impacts the speed and quality of knowledge transfer and transformation is the use of a prototype to learn. Formerly, the prototype had to be purchased before the official transfer from the supplier could take place. Nowadays, the purchase is not necessary as the supplier can lend the prototype to their business partners.

A technique that improves the quality of the transfer is the use of metaphor and analogy in communicating with those of different disciplines. According to the Presales Engineering Manager:

> "*If we are transferring knowledge about a DNS product, I can use the word DNS directly. They already know what it is. But if I have to train them with a new technology, such as firewall, then I have to compare it with the security guarding service*" (Presales Engineering Manager, Thai, Male)

The above statement implies that if the recipients already have background knowledge on the subject, the transfer using technical jargon is possible. But if the subject is about exploring a new knowledge territory, the use of metaphor or analogy to compare to something already known becomes necessary. Metaphor and analogy can help the recipient relate the new knowledge to something they know and can map this in their head. In this way, the learning can be faster and more efficient.

Process and Routines: Lesson-learning Routine is an important process, especially for the sales team, especially when it relates to the customer and the technique to

close the sales deal. The Lesson-learn routine is conducted once a week to share the activities and encounter experiences among the sales team member.

Apart from the weekly routine, a review meeting session is conducted every three months to gain insights into customer satisfaction. This session is also used to evaluate performance, with the key measure the success of customer retention. The meeting will reflect what went wrong and what went right to satisfy the customers, and how to retain them.

4.2.4 Company D Case Study

4.2.4.1 Company Background

Company D was founded in 2008 as a one-man company. Company D offers consulting services on computer platform architecture, mainly Microsoft Windows Server, Microsoft Exchange e-mail infrastructure, and Virtualization Server Platform. The company performs all services from design, planning, installation, server migration, service integration, and diagnostic and troubleshooting.

The company now consists of 5 persons loosely formed to serve the customer. The Managing Director acts as both the executive and service engineer. The other 3 are the network engineer, software development engineer, and a sales person. The last person is the administrator for back office clerical supports. The company does not have a fixed physical office. Everyone is working from home, using communication technology to interconnect, especially when there are projects from customers.

The company enjoys being on a small scale to serve a few customers. It does not wish to step further into new territory to provide extra services. It is quite interesting to explore how a small company of this scale obtains support from their suppliers and

partners, gaining extra knowledge, and assimilating it across the geographically dispersed team members.

4.2.4.2 Primary Research Question

"How do IT SMEs absorb new knowledge?"

Company D is focusing their service on Microsoft solutions. Each of the joining team members had more than 8 years knowledge of Microsoft products before joining the company. Each person has expertise in a different knowledge area. Thus, everyone in the company has his own knowledge space and all are teamed up when there is a customer request. The learning starts either from the customer initiated demand or from a new product or version release from Microsoft. The Managing Director will inform the team if a study or lab should be set up to gain new understanding. Communication with teams uses collaboration technology; for example e-mail, chat-program, or video conference:

> "*We have very flat organization. There are 5 persons in my company. They are outsourced staffs. When I need resources to do the work, I call them*" (Managing Director, Thai, Male)

From the above statement, it is indicated that the company is loosely formed to handle requests from customers. The operating cost is very low through the use of outsourced staff. The company does not have a permanent office. Meetings are on a need-to-meet basis. It can be at a coffee corner, virtual cyberspace, or on the customers' premises. Each individual uses their home as their workplace. Note that when this interview was conducted, the registered address of the company was used, and it is shared workspace with other companies.

"*We offer service to customers. The hardware and software are something that follows. We can't beat the competitor on pricing, so I sell know-how in the form of service*", and "*The thing that challenges me is that Microsoft will have new product every 2 years. This is forcing us to learn new things all the time*" (Managing Director, Thai, Male)

The company defines itself as a consulting company with knowledge and expertise as the core products. Microsoft products are changing continuously with a new release every 2 years. Constant learning is the key to the company's survival. When there's a new release, the team will be called to set up the learning lab, which is at an individual residence.

Being a Microsoft partner, the software and lab instruction manual is available online. Most of the new knowledge absorption is through online information search and hands-on experiential learning in the self-instruction lab. However, the knowledge absorption does not come from supplier support, but from self-learning in the online community context:

"*Google is the biggest source of knowledge. Microsoft may be the originator of Microsoft's product knowledge but it gets expanded in the cyber world*" (Managing Director, Thai, Male)

Microsoft is the original source of knowledge by putting their explicit knowledge on the web, the knowledge is expanded through an online communities and Company D learns from these sources. They also are a contributor when a new knowledge gap is found from their lab practice. With this, knowledge is enriched with more insight from the online communities.

4.2.4.3 Sub-Research Question 1 (RQa)

"How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?"

Identifying and recognizing value of externally generated knowledge: The indication of new knowledge comes from the release of new products or a new version of existing products. Company D focuses its services on the Microsoft Server Series of products, including the Windows server, e-mail, and collaboration server.

Learning from and with partners, suppliers, customers, and consultants: Being the Microsoft partner is a benefit in terms of accessibility to the online resources, including the software trial and technical knowledge repository.

Transferring knowledge back to the organization: Transfer occurs when the Managing Director directs all of his team members to conduct a lab test on the new release product. The technical knowledge internalization occurs through practice in the lab environment:

> "*There is some knowledge that we are indirectly inhibit from doing in the lab. Without doing the lab, the hidden knowledge will not reveal itself. This is the part that the customer is concerned about most as the hidden knowledge will not be surfaced just from having a certificate alone*" (Managing Director, Thai, Male)

This practice reveals new knowledge gaps. This is the hidden treasure that differentiates Company D's service from others, which results in competitive advantage.

Facilitating variation: Since the organization is flat and small teams are loosely formed the stage of preparing for new knowledge is not clearly exhibited.

Internal selection regimes: The Company D strategy offers focused service on some specific products:

> "*The strategy on product selection here is that we focus on some certain products that fit our customers. Microsoft and VMWare have many products. We cannot do them all*" (Managing Director, Thai, Male)

This means that when there is a new update or the release of a new version, the selection process has been executed and concluded. The selection is not done by the company, but by the manufacturer.

Sharing knowledge and superior practices across the organization: There is no formal training across the organization. Most learning comes from the lab test and on-the-job training with live projects.

Reflecting, updating, and replicating: The new knowledge gained from doing the lab and the implementation for customers is documented and shared among team members and the public knowledge on the online community, as well as applying it to other customers.

Managing adaptive Tension: Company D takes advantage of being small and flexible, to move and learn fast:

> "*Benchmarking with other competitors, I know we have strength in flexibility inherited from being a small company with high flexibility. I can move fast. When there is a new release of product, I just go into web site and study. Then I send information to my customers. For a larger company, they have to send out their staff to learn first before being able to communicate with the customers*" (Managing Director, Thai, Male)

Company D can move ahead faster than a larger rival. This provides competitive advantage, which directly serves the needs of customers.

4.2.4.4 Sub-Research Question 2 (RQb)

"What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?"

Agent Roles: The decision maker about the absorption of new knowledge is the Managing Director. The call to assemble the team is made up when there is a new release or an upgrade of a software version from the manufacturer.

The different for commercial knowledge transfer from technical knowledge transfer is that the product manufacturer supports the sales knowledge transfer with instructor-led classes and sales materials, while most of the technical knowledge transfer is self-learning from online materials:

> "*Microsoft offers instructor-led class for Sales. The class is delivered in Thai by the Microsoft staff. They also provide consulting service to us in closing the sales. They help us prepare all sales and technical documents including presentations. When a customer requests product details, I will forward them the material. But if they need a presentation and if it involves technical knowledge sharing, the distributor and I will visit them*" (Sales, Thai, Male)

In this situation, the sales and the suppliers must work closely together. The rapport and relationship is formed. The sales representative needs the supplier to support him on closing the sales and visiting the customers. Here the Social Relationship has impact on the knowledge transfer.

Behavioral Factors: A factor that impacts the learning of new knowledge is the Thriving to be in Business. By thriving it means a company is trying to stay in

business by obtaining compliance license of the new released product to remain as an eligible partner of Microsoft or other manufacturers. The key requirement from the supplier is that the supporting engineer has the certificate issued by the supplier. The certificate is valid for 2 years. This means that the examination to pass the certification must be done every 2 years. Otherwise, the company will lose its legitimacy to support the customers and access to the digital resources the supplier provides:

> "*The company supports all cost incurred for certification. The team just has to learn and pass the exam to get the certificate to do business*" (Managing Director, Thai, Male)

For Company D, the Managing Director will devote himself to study and sit for the exam. Fees are involved for Technical certification examination, while the sales certification exam can be done online, without any fees. Sales certification is required to get the supplier commercial team to help on selling to the customers.

According to the Managing Director, another factor that impacts the success of the company is the Trust from customers:

> "*Doing lab builds necessary knowledge which can solve the problem for the customer. This gains trust from the customer*" (Managing Director, Thai, Male)

The trustworthiness is gained from the speed and thoroughness in supporting a new release version of software from the supplier. Setting up the lab is a crucial step in learning. New insights and secrets will be revealed and these are what customers need.

Another behavioral factor that influences the learning is the passion to learn:

"*What I have done to share knowledge with the customer is my pure passion that I have toward my customer*" (Managing Director, Thai, Male)

With loosely formed alliances designed to serve customer needs, everyone on the team must have a high discipline in self-learning. Passion becomes an important factor to orient the learning toward customer support.

Impact Factors: A first factor that impacts the learning in Company D is the use of technology to bridge the loosely formed team member alliance. Technology-assisted learning from partners impacts the absorption in many ways. First, the lab exploration requires the access to the source of software and instruction manual for self-experimental learning. Second, the technical knowledge can be assessed from the online community. Third, the communication among team members to share the findings exploits the benefit of e-mail, video conferencing, and chat application. Fourth, the technology remotely supports and shares knowledge with the customer. This technology can conduct on-the-job training by interactively guiding the customer while providing support.

A second factor that has impact on knowledge absorption is the strategy of the company. The decision to focus on a certain product from a supplier and stay focused results in similar knowledge traits. In this way, the small team does not have to learn and adapt so much to the breadth of the new knowledge, but can explore the depth of the knowledge, making them the expert on the specific product.

A final factor in this regime that is used for measuring the effectiveness of Company D's service is the Customer Retention factor. When a customer renews the Maintenance Agreement (MA), it is a good indicator of satisfaction with the service

provided by the new knowledge. Thus, MA renewal is the measure of the effectiveness factor against competitors.

Processes and Routines: The technical knowledge absorption initiation starts from the release of a new version of software from the supplier and requirements from customers. Decision making is highly influenced by these two forces. Suppliers also compel learning by Company D and other business partners through the certification programs. Prototyping is a very crucial factor to gain in-depth expertise and experiences. The process to access and set up the prototyping lab and the routines and procedures of doing the lab are available for partners to access online. Additional knowledge is obtained through the online community and the contribution of add-on knowledge is provided to the community:

> "*Some projects require a variety of knowledge from a multidisciplinary team. We have to start breaking the work into parts. We have to think which part is to be performed by whom. We select the partner through trust. Otherwise we may have trouble delivering the work as we cannot control them*"
>
> (Engineering Partner, Thai, Male)

Working in a project with partners from different companies requires a high degree of coordination. Controlling them to have them do what is required is sometimes not an option here. They have their own practices, standards, and operating procedures from their own operating discipline and their company code of conduct. So, coordination rather than control is used to have them operate in the way to produce the required result. Coordination requires a good social relationship.

There are routines to strengthen the relationship between Company D's partners. The partner social relationship building routine starts with Company D sending their

team members to attend conferences. This informal networking builds relationships among these partners, who have different competencies and can help one another when there is the need to have a variety of services. For example, Company D does not do customized programing, but the company has partners who offer this service. When there is a need in this area, Company D will refer the customer to that partner.

4.2.5 Company M Case Study

4.2.5.1 Company Background

Company M has been in business for almost 25 years, having around 30 employees. Company M came to market as a System Integrator, so called SI, focusing its services on Microsoft Server products, which they call the Enterprise Solution. They have been servicing Government Agencies and Corporate Enterprises with implementation and support for Microsoft Directory services, Microsoft e-mail, file sharing services, printing, video conferencing, backup and recovery services, and virus protection.

The Company M organizational structure is composed of the functional formation of Engineering, Pre-Sales engineering, Sales, and Back office support (HR, accounting, and Administration departments). Each department has a designated manager to supervise the operations. All of them report to the Managing Director.

From informal discussion with the Managing Director, it appears that his concerns are on staffing. He said he could not get top notch graduates from universities due to the low payment. What he can do is focus on constructing skills in ordinary students. Once the skill sets are built up, another concern is retaining these skilled employees. This follows the same reasoning; with salary increases every year, he cannot afford to hire skillful, but expensive, employees and, once skilled, employees want more.

Considering this constraint, the Managing Director invented a business partnering model which supports his skillful staff in growing their own business and becoming partners. The new partners then form social alliances with Company M. When there is a complex job that requires skill from one of his partners, Company M asks for help. One of the partnering companies that was formulated this way in an alliance is Company D (in the previous case study).

4.2.5.2 Primary Research Question

"How do IT SMEs absorb new knowledge?"

As confirmed by the Managing Director of Company M, the competition in the IT SME market is very strong. Selling Microsoft System products does not provide a high profit margin. The competition would settle if some competitor yields 1-2% margin. Company M cannot survive by just selling this product alone, which is the reason the company is also selling integration services based on Microsoft products. As noted in an earlier case study, because of the nature of the Microsoft product life cycle, there will be a major upgrade on each of the Microsoft product lines every 2 years. This means the learning and certification for the engineers has to be refreshed every 2 years as well. This is reflective of the IT SME market as highly dynamic and that continuous learning is inevitable.

One of the Company M's employees was asked what keeps him at the company despite the low pay rate and his response was tightly related to learning and gaining experience. Being in a small company benefits him in having to learn both the depth and breadth of knowledge, compared to being in a large organization where the conceptual level is enough, but learning is not in-depth:

"*Being with a small company gives you the chance to expose yourself to many technologies. In a large company, each person will be assigned specifically to a certain area of responsibility. Being here, you have to work in every area and have to conquer them all. This is how I learn and develop my skills. I gain more experiences being here*" (Salesperson, Thai, Male)

The absorption of new knowledge starts when there is a major upgrade of Microsoft and other suppliers' products. Engineers in the company know that they have to study and re-take the certification exam. All training materials are available on the Internet. If there is a new product the company decides to market, then the supplier will organize a face-to-face formal training and workshop class.

For commercial knowledge, there is no certification required, but the salesperson needs to update their knowledge. The transfer will be conducted through informal channels from the engineering team to the sales team.

4.2.5.3 Sub-Research Question 1 (RQa)

"How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?"

Identifying and recognizing value of externally generated knowledge: The sequence to start knowledge absorption in Company M is initiated by requirements from customers and the major release of a new version of software from the manufacturers. Once the new knowledge has been triggered, the decision for absorption is made by the Managing Director.

The new knowledge absorption is systematically imposed by the supplier, with learning through the certification system. Engineers in Company M have to pass certification to ensure the new technical knowledge is learned. The certification is the

enforcement mechanism of the manufacturer for the system integrator to be eligible to provide service on the products. The examination for certification incurs cost. For Company M, taking the certification exam is a serious issue as the cost is borne by the company.

Learning from and with partners, suppliers, customers, and consultants: Apart from certification examination, which is a self-study on the context of the new release upgrade, the supplier assists in the transfer of new knowledge. They either come and do on-site knowledge transfer, or organize events outside so their partners can join and learn.

To ensure the new knowledge has been effectively transferred to Company M, the supplier organizes a formal lab training. This occurs prior to providing support to customers along the value chain.

Both technical and commercial knowledge are transferred with assistance from the supplier. For commercial knowledge, the supplier guides the Company M Sales team on the selling technique, the customer approaching technique, and promotional details. The Salesperson confirmed that commercial knowledge transfer occurs almost every month:

> "*For the Sales, our supplier has knowledge sharing for us. They share with us the selling technique, how to sell to different types of customers. They will organize it every month*" (Salesperson, Thai, Male)

Because of the frequency of this knowledge transfer activity the supplier uses venue to exchange information and provide feedback, so they can learn from Company M's Sales team what has been encountered when approaching the customer and how they can actively provide the required support.

Transferring knowledge back to the organization: When the supplier comes in to transfer knowledge or organize formal training sessions, Company M captures the sessions using a video recorder. According the Presales Engineer:

> "*We do the recording of the knowledge transfer event. This is for the ones who are not in the office, do not have the chance to attend the training, or engaged on other tasks with customers*" (Presales Engineer, Thai, Male)

Facilitating the variation: Company M uses its general meeting (they call it the Monday Meeting) to inform, update, and share what is about to happen as well as the results of activities, including knowledge exploitation—how new knowledge is applied and performed for commercial purposes. Attendance at the Monday meeting is mandatory for all the staffs.

Apart from the formal meeting, the way the office is arranged has an impact on knowledge sharing. In Company M, all desks are set in open spaces. These spaces allow the team to communicate openly and clearly when there is something coming up. For example, the onsite observation showed that engineers gathered around a workstation to discuss some issues. This open space helps them communicate easily and instantly.

As well as in the physically shared space, communications occur over virtual space with the assistance of a virtual chat room application. Engineers communicate with others, even when they are in different places. As confirmed by Presales Engineer:

> "*We have venue to share. Nowadays we use LINE [virtual chat room application]. If we encounter any problems and engineers are engaged with tasks at another site, we use this LINE group. So, if any engineer in the group*

has encountered the same problem, he will respond" (Presales Engineer, Thai, Male)

Internal selection regime: Company M has a strong solid stance on focusing on product handling. Any product that requires new resources that does not match with the existing knowledge traits is rejected. Even though most of the decisions are made by the Managing Director, he has given clear guidelines on the selection process. The following statement confirms his guideline for decision making:

"*We have two anti-virus products on hand already, Trend Micro and Kaspersky. There are cases that customers want us to support on McAfee [another anti-virus product]. I discuss this with the team and we ask ourselves if we have capacity to handle another anti-virus. If we are to support, there are so many things that we have to learn*" (Presales Engineer, Thai, Male)

The new product is then turned down due to lack of resources and knowledge. They have estimated that in this situation it is not worth developing new knowledge. This discussion is held on an irregular basis. However, the decision to be made must be confirmed by the Managing Director.

Sharing knowledge and superior practices across the organization: Company M use the Monday meeting as the venue to share new knowledge with others across the company. If more in-depth detail is required, a follow up knowledge transfer session will be arranged. When sharing the knowledge, recorded sessions of the supplier are replayed if there is any special attention required.

Reflecting, updating, and replicating: At this stage, the transfer of knowledge goes across the company boundary. Company M modifies the transfer knowledge contents materials obtained from the suppliers, make it easier understandable, and match up

with the customer's actual setting and context. Having a visual map of their architectural system in mind helps customers expand their understanding:

> "*We take their [the suppliers] contents and select some that fits with the customers' environment setting. We do this to help customers understand as they are already familiar with their systems*" (Salesperson, Thai, Male)

Managing adaptive tension: Microsoft has a scoring system related to the quality of its solution partners. Company M is striving to be in the top 10 of the 'trusted partners' in Thailand. As stated by the Managing Director:

> "*We cannot do everything by ourselves. But for what we do, we have to excel. We have to be in the top 10 list of Microsoft partners in Thailand. If they are talking about the product and services that we are providing, our name must be on their lips*" (Managing Director, Thai, Male)

Ranking in this list is crucial for Company M. It has become the easiest benchmarking index for the companies in the industry. According to Microsoft information on the website, the listing is constructed from the annual survey.

Another benchmark is made internally using Monday meetings. Every customer-visiting engineer and sales person has to share what they have learned from contacting customers in the previous week:

> "*Normally, after visiting customers at the site, we have to write a report to inform every one of what we have done and what trouble we have encountered. We discuss the issues with others in our weekly meeting to overcome the problem and make it success*" (Engineer, Thai, Male)

By carrying out this retrospective knowledge sharing and discussion, possible solutions are identified. This is a key process for knowledge sharing and feedback learning.

4.2.5.4 Sub-Research Question 2 (RQb)

"What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?"

Agent Roles: Throughout the entire knowledge absorption process, there are a few roles that are dominant.

The first role is the decision maker. The Managing Director plays this role from identification through internal selection. The decision is made from the existing knowledge traits of the employees and the new set of requirements that need the development of new knowledge, supporting skills, and extra man-power. The reason the decision is still retained by the top executive is the trustworthiness, as indicated in in the following statement:

> "*The decision of what product to try and market it is still lying on me. I'm still held responsible. This is because others cannot perform this task yet*"
>
> (Managing Director, Thai, Male)

This is quite understandable as the trial of a new product and realizing the new knowledge involves resource allocations and adjustment of the organization. Everything means investment.

The second agent role is to act as gatekeeper and translator. When transferring knowledge across the entire organization—from one discipline to another, including end customers—language is still a barrier. Transfer requires the use of a common language and the development of documents that have an understandable content. In

common cases, Engineering performs the role of gatekeeper of the knowledge transfer, receiving from the supplier's end, transferring and translating to others, and acting as the knowledge center when providing understanding confirmation.

Behavioral Factor: A common factor that is defined as the barrier for knowledge transfer is Psychological Safety. When asked about proposing new ideas, the Managing Director stated:

> "*He [an engineering subordinate] may have fears, or the way I talk is wrong. It might be too strong, making him feels that he cannot speak like me, cannot defend like me so he chooses to be quiet*" (Managing Director, Thai, Male)

This clearly indicates why the decision making is made only by the top executive of the company. This also refers to the Trust and Respect factor. The following statement confirms this:

> "*There is some proposition of ideas and new products to me. However, the level of presenting to me has not reached the challenging level yet*" (Managing Director, Thai, Male)

The top executive still believes that his employees are not capable, or the presentation method is not well conducted. This comes from lack of experience in idea proposal or lack of opportunity.

Impact Factor: There are several factors that have impact on the absorption of the knowledge. Starting from the Identification of new knowledge, a factor that triggers the absorption sequence is Supplier Enforcement. The supplier can compel Company M to learn through the renewal policy of certification. Each product will have a major upgrade during a certain time span. When the major release comes, all partners must relearn in order to pass the certification examination, otherwise they will not be able

to receive further support or be eligible to provide product and service to the customer.

Another factor that has an impact on the decision to assimilate and transform the new knowledge is the Fit to Knowledge Traits. If the new knowledge fits with the existing knowledge structure, absorption can occur, with minimal effort. Great deviation from the Fit to Knowledge traits always results in either a large investment in development of new knowledge capacity or recruitment of new employees who have the relevant knowledge.

When transferring knowledge into the company, and sometimes to external customers, support from the supplier is required along the way. Efficient transfer also depends on the Social Relationship between the supplier and the employee. This bilateral relation is established from the supplier-partner relationship enhancement activities; for example, the annual get-together party, or New Year's party.

Another factor that has impact on the quality of knowledge absorption is the use of a Prototype to encourage learning and skill development. Before engineering can provide technical support or the Presales engineering team could make the technical sales, they both need to develop their knowledge through actual hands-on practice. The prototype comes either through a partner purchasing program or the loan by the supplier. It is a mandatory requirement for Company M's engineering and presales engineering team to explore new functionality before eligible to provide support to its customers.

Another two factors that have impact on knowledge transfer quality are the Repetitive Assignment and Capability Matching to Task Assignment. Repetitive Assignment comes from the fact that the recruited employee of Company M may

have a slower rate in learning compared to the top-notch university graduates. Company M chooses to assign repetitive tasks so the employees can learn through repeated experiences. According the Managing Director:

> "*When we assign a task to a new recruit, we re-assign them again and again until he is skillful. Doing this is also a practice for him to have concentration on the task. This is an important lesson for me that by giving the right task with right amount of workload repeatedly, he will be able to master it*" (Managing Director, Thai, Male)

Another factor is the Capability Matching factor. Company M chooses to groom their employees by finding the right knowledge and skill for each of them. Based on the assumption that those recruited are capable of doing the job and learning, then assigning the right work which allows time for each of them to absorb and learn is a crucial way to build the knowledge capacity:

> "*I have been wrong many times. When I recruited my employees, I had selected them with confidence that they could do the job. When my old employees resigned, and joined other companies, they could deliver good work there. This makes me think that maybe the work that I assigned did not challenge them. This is my foolishness, that I do not know how to put the right man for the right job*" (Managing Director, Thai, Male)

Company M has a unique business support arrangement through the use of outsourcing of supplementary knowledge. When an employee is with Company M for a certain period of time, the Managing Director will encourage him to take his own path by becoming an external outsourcing resource for the company. When Company M has a project that requires expertise from these skillful and knowledgeable

engineers, this ex-employee of Company M will be called in to provide support. This Outsourcing Organizational Arrangement factor yields twofold benefits. First, Company M does not have to carry the burden of the expense to hire the expatriate. Second, the outsourcing resource has the freedom and flexibility to step out and pursue the dream of being an entrepreneur. Moreover, between the two companies, there is a previous mutual agreement and bond that allows both companies to grow.

A factor that impacts the free flow of knowledge transfer is the Arrangement of Open Space. The office in Company M is organized with lots of open spaces so that when an engineer discovers something new, he can shout to gain attention and share knowledge in any instance.

Process and Routines: Company M has some specific routines for the absorption of knowledge. First is the knowledge screening routine. When there is new knowledge to be absorbed, engineering will perform the initial search. Once interest on certain topic has been shown, the company will form a knowledge screening committee to act as a panel to screen and select. The criteria for selection is based on existing knowledge traits and whether outsourcing is required. Then, a prototype will be obtained to begin the exploration and absorption of knowledge. The last routine is feedback. Feedback is provided at every step along the absorption process.

4.2.6 Company T Case Study

4.2.6.1 Company Background

Company T has been in the market over 12 years, providing System Integrating Service on IT infrastructure, including network, telecommunication systems, network security, CCTV, data center, customized solutions to fit specific requirements of each individual customers, and aftersales maintenance services. Being a system integrator,

Company T needs to have both the depth and breadth of a variety of knowledge as they are providing end-to-end implementation and maintenance services.

Integration of multiple systems into a solution requires a great deal of partnership. Company T has multiple suppliers with various scales and varieties of product ranges. Company T also has to work with other industries such as construction and manufacturing in order to make some customized products to fit some specific customers' requirements. In these instances, sometimes new innovative products have to be developed.

Half of Company T employees are engineers. The organizational structure is divided into functional departments, Engineering, Presales Engineering, Sales, HR and Accounting, Legal and Procurement, and Administration. Each department is led by appointed managers, with every manager reporting to the Managing Director. The primary role of the Managing Director is taking full responsibility for the sales, leaving the technical and back-office management to the engineering and administration managers.

According to the information on the recruitment website, employees of Company T must have a background and experiences in some areas of IT. English is also a required competency. The job descriptions of all available positions require working with company-developed forms and documentation, which might be from the requirement of the best practice, ISO9000, with which Company T has complied.

4.2.6.2 Primary Research Question

"How do IT SMEs absorb new knowledge?"

Company T is a customer demand-driven company. It is very rare that Company T will initiate new knowledge acquisition based solely on industry trends or from its

own interest. This customer demand approach has direct influence on Company T's organizational arrangement. Company T has a complex functional organizational structure. To serve a customer demand, the whole company moves together in different functions. As well as having different departments based on the functional form, Company T also divides the function within each department according to product classification. For example, Company T has different persons responsible for network, security, and CCTV. This means that to serve a customer who is looking for an integrated solution, a representative from each area has to form a team, normally a big team, with the orchestrating of the team requiring an extra project management function to deliver the outcome.

Involving multiple disciplines requires good knowledge transfer among team members, good coordination, and good interpersonal relations. Thus, the most important and challenging factor in absorption of knowledge for Company T is not from various sources, but from the internal assimilation and transformation among employees.

Unofficial conversations with the Managing Director show that his passion is to approach customers to make sales. He believes that social relationships bring the sales, while the technical knowledge will guarantee the quality and bring back repeated sales:

> "*The Thai market is different from elsewhere in the world. Here, sales are made out of your connections. You must have your network. The knowledge that we have can be obtained from elsewhere in the industry. To get the sales, you must have connections. However, if you have good connection, but not*

good technical knowledge, the customer will not buy from you either. Both complement each other" (Managing Director, Thai, Male)

It is clear at this step that the Managing Director devotes his efforts to paving the way until the sales are made. He is even always on call to service if a customer wishes to meet with him at an odd hour of the day, for example very late in the evening for discussion over a very late dinner. He then leaves all of the technical work, including the transfer and the exploitation of knowledge, to the rest of his employees.

4.2.6.3 Sub-Research Question 1 (RQa)

"How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?"

Identifying and recognizing the value of externally generated knowledge: In the identification stage, the customer is the trigger. Company T will center its absorption sequence on customer needs. After the needs have been identified, the Managing Director will consult with his engineers and sales on matching the solutions to fit the needs. Once the key technological components are found, the suppliers of each product that make up the solutions will be contacted.

The search for key product components to offer to customers is based on references from the companies which rank the industry's products, for example, Gartner:

"*The key product components that make up the solution will be identified. I look up from the Gartner report on such product components, and then see what brands are discussed and how they are ranked in Gartner's quadrant. Then we choose the top three highest rankings and contact the suppliers*" (Managing Director, Thai, Male)

Learning from and with partners, suppliers, customers, and consultants: Once the supplier is contacted, Company T will prepare for knowledge transfer for both technical and commercial knowledge. The supplier demonstrates the product and offers the training. The training will also cover the commercial aspect for the sales team to give feedback to the customers.

Sometimes Company T uses experts or consultants to recommend the right components for the solution. The use of external knowledgeable resources such as consultants occurs when Company T is exploring areas where they have little or unknown knowledge. As confirmed by the financial manager:

> "*When we have a knowledgeable person to help, our MD (Managing Director) has the tendency to believe him. Our MD has a lot of experiences. Sometimes he doesn't trust our internal knowledge. He tends to believe those outside who have so much exposure to another environment*" (Finance Manager, Female, Thai)

Transferring knowledge back to the organization: The lead engineer who is responsible for each product line will be responsible for knowledge transfer from the supplier. According to the Presales Engineering Manager, the common transfer context is the comparison of functions and benefits over the competitor's products. This clearly means that the topic of the transfer fits the existing knowledge traits, such that laying a foundation of knowledge is unnecessary for the transfer. Only the add-on differences are needed.

Facilitating variation: When new knowledge is identified for adoption, a team is formed. The head of each department will consider sending a member to join the team. As mentioned above regarding the functional formation of the organizational

structure, team members come from almost every department. The team is big and inflexible. A special department, the Project Management department, is designed to orchestrate the variety of knowledge traits.

The arrangement of multiple departments with structural complexity resembles the structure of a highly complex, larger scale enterprise. Apart from inflexibility, the complexity results in higher cost and complexity of management. Company T also adds another layer of complexity through the compliance with the ISO9000 standard in quality management. This standard comprises many rules and regulations to which Company T must conform, including the quality management system, documentation manual requirements, and control of document requirements. Doing so ensures the company documents all activities and results. A special position such as document administrator is added to handle this task. Although there are advantages in management and control that improve internal communication and customer services, some employees feel that this process is a burden, but inevitable.

For new knowledge that does not fit within the existing knowledge structure, Company T will perform external sourcing of new knowledge through recruitment. A new position title is created with the right candidate employee competency and experiences:

> "*From a project from one customer, we realized that we have problem supporting. It seemed like the MD [Managing Director] saw that the problem was from this point [lack of supporting workforce], so he asked for the recruitment. Maybe he saw that similar problems might occur to some other projects or he expected to expand in this line of business. We cannot find such*

a person from internal resources; that is why we have to recruit"

(Administrative Manager, Thai, Female)

The above statement reflects that sometimes being unprepared can negatively affect the quality of service. Recruitment occurs after the winning of a project from a customer. The recruitment may take some time, and it also takes additional time for the new employee to settle in. Resource allocation and planning is seen to cause some risks associated with knowledge transfer and exploitation.

Internal selection regimes: The decision on new knowledge absorption is made solely by the Managing Director. When disagreements occur, the conflict is resolved by executive decision.

"*It doesn't matter if I agree or disagree. The MD has all the rights to make the final decision. He may see the opportunity if this project is to pursue, there may be another similar project, and this may end up having more profit to our company*" (Finance Manager, Thai, Female)

The Monday meeting is used as the venue for information update and knowledge assimilation. Every department must have a representative attending and the pros and cons of the new introduction will be discussed. The major discussion topic is clustered around resource allocation and how to handle the new knowledge absorption.

Sharing knowledge and superior practices across the organization: The internal transfer of knowledge starts from the reading material assignments from Engineering to other disciplines. Internal mail is used as the means to deliver the contents. There is rarely any formal in-house training because of time constraint. Most of the transfer occurs in the set-up lab or on the job. Self-learning will lay the technical foundation

and on-the-job will give full understanding of the complex issues and provide skill development:

> "*We allow them [the new comers] to test and try. We will choose a customer site that is not yet operating. We will let them do the configuration and testing. I will then simulate the problem and will ask them to try to solve it. I will show them how to monitor the operation and spot the problems. Let them try with remote accessing to provide rapid response and avoid travelling to the site*" (Engineer, Thai, Male)

For the transfer to non-technical employees, the engineer will act as the gatekeeper to the topic of the knowledge transfer. They will provide the answers to enquiries or connect to other people or external resources. The learning will come from comparing of results from the last actions to current ones, and the match with customer feedback:

> "*I have no technical knowledge. I don't know the configuration setting. I will focus on the time spent or the problem. I will compare it with the last action and spot the differences. Last time it was like this and this time it is the same. Did we change the spare part, or have we changed the way to address the problem? I cannot suggest to them what action or how to address the problem. I will ask if the customer has any feedback*" (Finance Manager, Thai, Female)

Another observation from the above statement from the Finance Manger is that a personal learning system is developed. In this case, the Finance Manager has no technical background knowledge. She has to keep herself up to the pace where her responsibility and interest intersect. So, she developed a spot checking system to track the differences and turn these into quality measures. This is done by combining her frame of reference into the context the engineer is discussing. This is the 'reverse

process of learning'. Instead of having the engineer use some common analogy to help the recipient understand, the knowledge recipient uses his own term to track and reflect the understanding.

Reflecting, updating, and replicating: This stage is the feedback loop from customers. Every activity that the application of knowledge has been connected to, will be recorded. According to the support engineering manager, the record is kept on a database system. This system serves as the knowledge base system for case reference:

> "*I try to update it as much as I can. From the customer's e-mail correspondence. I extract the part where we solve the problem. Once the problems are all solved, I convert them to a PDF file, store it, and it becomes our knowledge*" (Support Engineering Manager, Thai, Male)
>
> "*We record all steps and compose a report on all the telecom works, including installation, configuration, and maintenance. We hand over the report to the Admin for archival on the system*" (Engineer, Thai, Male)

The process of recording is an ISO compliance requirement which Company T treats seriously.

Managing adaptive tension: The only indicator for new knowledge adoption and exploitation is the customer feedback. Every Monday, the meeting will reflect what has happened in this regard. This venue is the place to share and look for ways to correct and improve the services. There is a special team assigned to follow up with the customer satisfaction:

"*The satisfaction survey team will coordinate with the relevant team and the customer. This satisfaction survey team will produce a report and share with other relevant teams*" (Administrative Manager, Thai, Female)

The review of service results is not only just from the team and customer side, but from the supplier side as well. If any projects do not get good support or quality knowledge transfer from the supplier side, this satisfaction survey team will report to the Managing Director for complaint escalation:

"*If the vendor [Supplier] does not perform to support us or up to our expected level of satisfaction, we will inform the MD and mark with a red flag into our database that this vendor does not meet our expectations*" (Procurement Officer, Thai, Female)

4.2.6.4 Sub-Research Question 2 (RQb)

"What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?"

Agent Roles: The decision-making roles fall solely to the Managing Director. This top executive will decide which knowledge is to be absorbed and how to engage knowledge from which business partner. Most of the decision triggers come from the demands of customers. As previously noted, Company T serves the needs of customers, but is very unlikely to lead with technological trends.

For formal knowledge transfer from suppliers, the Human Resource (HR) team will be involved as a gateway for company-supplier contacting. Any requests for training and development will be made through the HR department. HR will gather the requirements and negotiate with suppliers to arrange the training course that will be most suitable to the needs from the engineering side.

The supplier is responsible for both technical and commercial knowledge transfer. The technical knowledge transfer will include all technical features and how to perform implementation and troubleshooting, while the commercial knowledge transfer will focus on what would be the customer's buying point. For the updating of additional new knowledge, the content will focus on the newly developed features, comparison with competitors' products in the market, and future trends.

In some circumstances where training is limited to a few persons, the engineering team lead will be the one who receives the first-hand transfer. He will then perform as the gatekeeper to re-transfer the knowledge to others within his team. This first internal transfer will be amongst the same engineering discipline, with very deep technical and details. This internal transfer could be formal or on-the job.

For inter-disciplinary knowledge transfer within Company T, the HR department will act as the medium to facilitate the transfer. The transfer will cover both the technical and non-technical subjects. The trained engineer will now act as the translator to convey the technical knowledge in simple terms to the rest of the company.

Behavioral factor: In transferring knowledge from suppliers, sometimes English is involved. There is clear evidence that English can be a language barrier and because of these engineers are sometimes fearful of asking. Thus, the fear of asking seems to be an inhibitive behavior, and becomes very common when transferring occurs in an unfriendly atmosphere or when strangers are present:

> "*There is fear of using English in questioning. The instructor should be aware of this. He should ask questions back to confirm the understanding*" (Presales Engineering Manager, Thai, Male)

The discussion of factors that have impact on the quality of knowledge transfer raised ideas about passion, ambition, and determination. Employees' passion to learn new things results in their searching out and exploring new knowledge, even though not assign to do so. The ambition to improve and see the company succeed is part of the culture of Company T.

Challenge is another motivational factor that drives the learning. The following statements confirm that:

> "*For me, I see that learning new things challenges me. Exploring into new things that I have not known before, something that is difficult. For things that I had already known, I will throw it to my subordinate*" (Procurement Officer, Thai, Female), and
>
> "*The way I motivate my subordinates is to create the crave of learning. I will tell them where we are heading. I challenge them that learning the new thing would let them be the only team in Thailand to know about this new stuff. Creating different knowledge will make others come and look for you*" (Presales Engineering Manager, Thai, Male)

Different people are challenged by different factors. Some prefer the difficulty of the subject to explore, some wish to possess the unique knowledge. From the above statement, it is up to the leader to know how to identify which kind of challenge fits each individual team member.

When questioned about monetary reward as a motivational factor to the new knowledge absorption, the responses confirm that Monetary reward is a good-to-have but not in all means. It also contains risk if there is no transparent and agreed upon measurement:

> "*Monetary reward has been implemented and used as the incentive to a project. This is used as a tool. It is also used as a tool to measure performance. Using a monetary incentive as a performance measuring index must be transparent and fair. It must not be based on feeling, but a clear and agreeable judgment"* (Presales Engineering Manager, Thai, Male), and *"Monetary works differently for different people. Some prefer to have it as a reward, but some wish to have other better fringe benefits*" (HR Officer, Thai, female)

Another key motivational factor is the feeling of being in a part of a successful team. This motivational factor surfaced in the interview a few times, especially when involving the support team. Responses from the Support Engineering Manager and Procurement Officer show that this factor is important to them.

With regard to negative behavior, there are a few instances that present in Company T. Knowledge hoarding exists in the Project Management unit, as confirmed by the Presales Engineering Manager:

> "*In the engineering departments, knowledge transfer occurs openly. However, in some departments, for example in project management, the knowledge is withheld [not shared]. This might be from the fact that work that is still inconclusive may have impact on the project status or legality. They may have to clear everything first*" (Presales Engineering Manager, Thai, Male)

From the above statement, timing may be an issue when the sharing of knowledge is inappropriate. For example, the request to share might be occurring right in the middle of the implementation of knowledge in a clandestine operation, while it is still

under stress to beat a deadline, or on a secretive trial that cannot have information released to competitor.

Another factor that has impact on the negativity of giving feedback on knowledge exploitation is the communication barrier. According to the following statement communication barriers exist in Company T:

> "*The managing director does not speak directly. If his subordinates do not inform him, he would assume there was no problem. Once he realizes later that there is problem, he will not call other team members directly. He calls me and asks me to relay the message to other team members. I have to act as the medium all the time and sometimes the message gets misinterpreted*" (Administration Manager, Thai, Female)

This barrier causes damages to the feedback routines. The actions to amend the problem sometimes are not done in a timely and proper manner. The company has tried to overcome this barrier by organizing the Monday Meeting to be the venue for sharing and discussing to find solutions and eliminate the gap from the communication barrier.

Impact Factor: Starting from decision making on knowledge selection, as the Company T decisions are clustered around the customers' needs, a key factor contributing to the decisions is that the new knowledge must help the customer to improve competitive advantages by reducing cost, increasing satisfaction, and increasing productivity:

> "*The new product is suitable for which customer is the key question before making the decision to provide our products and services. The new solutions must help the customer in reducing their operating cost, increasing*

confidence, and increasing the reliability of their system" (Managing Director, Thai, Male)

A crucial factor that employees of Company T agree upon is the shared vision; knowing what decision is made and the updated status of knowledge absorption. The Monday meeting venue to update and share the direction in which the organization is heading and performance results is what everyone is looking forward to:

"*For example, the work of [the Presales Engineering Manager] is used and known only by him. When he had a problem, no one can help. Now we have Monday meeting. All the cases have to be shared. If he is not in, others on the team must do the sharing"* (Finance Manager, Thai, Female), and

"Before, everyone is just focusing on his work, not sharing. But now, every Monday, we all have to join the Monday meeting. If the discussion topic is related to you or not, you have to join it. You have to know the progress status of other projects. Everyone's work is connected" (Administration Manager, Thai, Female)

A negative factor that has impact on the absorption and exploitation of new knowledge is the quality of knowledge transfer. The interview with the support engineering manager showed that there are problems transferring knowledge from one unit to another:

"*Now I still do not have subordinates of my own. They are still working for other departments, like Presales or Engineering. When there is an aftersales supporting issue, I will ask each department manager to allow their engineers to support the customer*" (Support Engineering Manager, Thai, Male)

The purpose of the support engineering department is to take over the work that has been done by the presales or the engineering departments. The objective of this department is to provide the aftersales support. The knowledge about implementation to customer must be transferred to this support engineering team. As can be seen from the above statement, this team does not have its own engineering resources. The borrowing of engineers who did past work for the customer means that the knowledge still resides in the memory of the implementing engineers.

A factor involving the quality of knowledge exploitation is feedback. Company T has established a dedicated department to follow up with the customer at the level of satisfaction. Sometimes feedback comes in the form of blaming from customers:

> "*Knowledge may arise when a customer blames us. If they set up a meeting to have serious discussion with us about our performance, we have to take note, memorize it. Then we have homework to do*" (Support Engineering Manager, Thai, Male)

Feedback can also come from others in a different department. This internal feedback occurs when dealing with coordination when other departments encounter some difficulties.

Inefficiency or lack of knowledge can also be pinpointed by the feedback through the time spent working on a project. If the implementation of a project takes longer than expected, then this is treated as a sign of insufficient knowledge:

> "*When we implement a project, and face a longer time of implementation than planned, we know that we have to change something. We need to put measurements on. We need to add more reinforcement resources. We have to*

discuss among our team of why we are having a delay" (Managing Director, Thai, Male)

Process and Routines: The process and routine steps of Company T start from the source of knowledge. Sources like customer initiation, supplier encouragement, and self-initialization are mentioned in the interviews. The most important source is the customer request. Once a need is identified, the supplier is contacted for solution matching. This is how it is decided that new knowledge is to be absorbed into the company.

From this point, the supplier engages with support for the knowledge transfer. Prototyping is involved when there is a major disruption of technology or major knowledge upgrade involved. Prototyping is required for knowledge and skill development. The dissemination of a decision is made public using the Monday meeting venue.

The decision on allocating resources will also be considered and planned. If the new absorption requires a special group of employees, then recruitment of required knowledge will be considered. The process here is to examine the workload of candidate employees who can champion the knowledge. If no such resource is in the house, a new recruitment process kicks in.

Internal transfer within the same discipline starts from the assignment to perform installation and configuration at the customer site. This on-the-job training with supervision from senior engineer will help the young engineers learn.

The transition from engineering works to the aftersales support engineering team starts when the engineers who are involved with the field work share with the rest of

the company the status and situations being encountered. This is considered as part of the project conclusion.

For cross disciplinary knowledge transfer, the formal introduction will be provided by the lead engineer. This has two benefits. The first is to use this internal channel to transfer the new knowledge, and the second, to introduce the knowledge champion or the *gatekeeper* who can help if more knowledge is needed.

Once the application of new knowledge has been committed, all steps of the configuration, problems, and troubleshooting procedures are developed and archived in the company knowledge-based repository.

When dealing with outside partners on projects that require special expertise, the transfer is carried out by discussing, asking questions, and observing how the work gets done. The check and balance process occurs when the partner does not provide a clear and precise answer. The involved team will then obtain a clearer explanation from another partner on their connected network.

Exploring the processes and routines used in Company T shows that the feedback routine occurs along every step. Feedback is a crucial step in learning and absorption.

4.2.7 Summary of individual case studies

Table 4.1 summarizes the 6 cases with regards to the primary research question (RQ). Table 4.2 summarizes the factors involving the absorption and exploitation of new knowledge in respond to the absorptive capacity meta-routines. Table 4.3 summarizes the factors contributing to the successful and unsuccessful absorption of new knowledge.

Table 4.1: Summary of Primary Research Question (RQ) at each company's level

Co.	RQ: How do IT SMEs absorb new knowledge?	Extracted factors
A	The process of knowledge absorption starts when Company A's informant reports on the new release of technology from the manufacturer at the country of origin. The process relies on gatekeepers to assimilate new knowledge within the company. The extent of knowledge transfer boundary expands from the company physical boundary to partners' virtual and physical networks.	•Organizational strategy o Focusing on product lines o Distributor (DI) •Knowledge transfer mean and method o Knowledge transfer boundary •Organizational structure o Functional structure •Triggering factor to absorption o Technology
B	Being a distributor of IT Security solutions requires close relations and interactions with product manufacturers and suppliers. The transfer of technical and commercial knowledge is assisted by the suppliers through formal channels. The assimilation is not just bounded inside the company, but spans across the company's boundary to customers.	•Organizational strategy o Focusing on technological area o Distributor (DI) •Knowledge transfer mean and method o Knowledge transfer boundary o External-inward knowledge transfer o Internal-outward knowledge transfer •Organizational structure o Mix structure •Triggering factor to absorption o Technology, government regulation, compliance requirements
C	Once the decision to absorb new knowledge is made, the organizational arrangement into small teams with full responsibility for knowledge absorption is formed. Direct formal and informal transfer from the suppliers. There is minimal use of gatekeepers during the transfer throughout the entire organization. Feedback of new knowledge transfer and implementation are reverted within the organization and back to the value chain of the industry.	•Organizational strategy o Focusing on customer's industry o System Integrator (SI) •Knowledge transfer mean and method o External-inward transfer o Intra-team transfer o Internal-outward transfer o External-revert transfer •Organizational structure o Divisional o Flexibility, Empowerment •Triggering factor to absorption o Customers
D	Absorption of new knowledge is through the practice of the hands-on lab of the new release version of product. Learning source is from online community content.	•Organizational strategy o Focusing on supplier o Value Added Reseller (VAR) •Knowledge transfer mean and method o External-inward transfer •Organizational structure o Divisional structure, Flat •Triggering factor to absorption o Supplier/manufacturer

(Continued)

Table 4.1 (Continued): Summary of Primary Research Question (RQ) at each company's level

Co.	RQ: How do IT SMEs absorb new knowledge?	Extracted factors
M	Company M focuses on offering service for Microsoft solutions. Microsoft has strong influence on the new knowledge absorption through its release of new products on an every-two-year basis. The new product comes with requirement for the certification. To stay in business, the staff needs to study and obtain the certificate.	•Organizational strategy o Focus on suppliers o Internal-outsourcing business model overcomes deficit of being an SME o Value Added Reseller (VAR) •Knowledge transfer mean and method o External-inward transfer o Championing responsibility •Organizational structure o Mix structure •Triggering factor to absorption o Supplier/manufacturer
T	Company T is customer-centric company. The decision about knowledge to be absorbed comes from the demand of customers. Organizational arrangements resemble those of large organizations, where every department is focusing on their assigned function. When new knowledge that requires integral use of expertise across knowledge disciplines is brought in, the whole company has to react to absorb this new knowledge.	•Organizational strategy o System Integrator (SI) o Majority adopter •Knowledge transfer mean and method o Intra-team transfer •Organizational structure o Functional structure, rigid o Centralized decision making •Triggering factor to absorption o Social relationship with customers and networking lead to sales

Table 4.2: Summary of First Sub-Research Question (RQa) and related factors

Co.	RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?	Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension
A	Lewin et al.'s (2011) absorptive capacity meta-routines work holds for Company A new knowledge absorption process. However, what differs from it regards the feedback loops. They are found in every stage, not just at the end as appeared in the meta-routines construct	• Source of knowledge: Supplier push, customer request, new technology, government regulation, competitor move	• Relationship with supplier	• Feedback	• Venue to disseminate knowledge and communicate	• Quick time to market • Wide market penetration: action plan is developed	• Tools, database, reports to store explicit knowledge	• Venue to share results • Knowledge sharing session • Feedback of internal and external results	• Competitor comparison

(Continued)

Table 4.2 (Continued): Summary of First Sub-Research Question (RQa) and related factors

Co.	RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?	Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension
B	The absorptive capacity meta-routines work fits well with Company B organizational structure and knowledge transfer processes. However, Lewin's internal selection regimes factor does not occur in this company as the decision making is dominating by the Managing Director since the early stages	• Source of knowledge: Security standard compliance, government regulation, and new technology	• Relationship with supplier: impact in knowledge transferring	• No evidence	• Empowerment: designated engineer is assigned to be product champion	• Decision making done since earlier stages by the Managing Director	• Use of simple language • Develop training document for knowledge transfer: for customer, and sometimes, supplier	• Extent of border of knowledge transfer • Meeting venue	• Knowledge spillover: Educating market to create demand pull

(Continued)

Table 4.2 (Continued): Summary of First Sub-Research Question (RQa) and related factors

Co.	RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?	Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension
C	Lewin et al.'s (2011) absorptive capacity meta-routines work holds for Company C new knowledge absorption process. However, the sequence of stages may not follow an orderly fashion. The engagement of customers into the transfer phases also spans across the company boundaries. Feedback at every stage must also be acknowledged	• Source of knowledge: Customer • Decision maker: Managing Director on commercial and Technical Director on Technical	• Relationship of informal vs. formal knowledge transfer and sales lead vs. potential buying	• Gatekeeper	• Flexibility • empowerment	• No evidence	• Development of explicit knowledge to be transferred	• Feedback • Customer retention • Knowledge retention • Social relationship	• Measure and monitor • Customer satisfaction • Customer retention

(Continued)

Table 4.2 (Continued): Summary of First Sub-Research Question (RQa) and related factors

Co.	RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?	Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension
D	Being small and providing focus on service for certain products deviate from some meta-routines, including Identifying and recognizing the value of externally generated knowledge, and Internal selection regimes. These meta-routines are pre-determined by the relationship with the supplier	• Knowledge source: new product release, new upgrade (Supplier push) • Decision maker	• Self-learning: Online material access	• Prototyping: Team perform lab setting and exploring for new knowledge	• Supplier influencing selection • Flexibility and agility from being small size	• Knowledge traits fit	• Develop training documents and procedures	• Feedback routines • Internal-outward knowledge transfer (transfer to customers)	• Competitor analysis • High agility benefit firm's competitive advantage

(Continued)

Table 4.2 (Continued): Summary of First Sub-Research Question (RQa) and related factors

Co.	RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?	Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension
M	Company M follows the sequence of absorptive capacity meta-routines. The uniqueness are the knowledge trait mapping, and techniques adopted to develop new knowledge	• Knowledge source: new product release, new upgrade (Supplier push) • Decision maker	• Supplier direct support on commercial knowledge transfer	• Prototyping: Team perform lab setting and exploring for new knowledge	• Meeting venue to share knowledge: every Monday • Open space for free flow of knowledge among members in the same discipline • Use of technology-assisted virtual meeting space	• Knowledge traits mapping	• No evidence	• Feedback routines • Supplier supply training materials	• Enlisted as Supplier's trustworthy vendor

(Continued)

Table 4.2 (Continued): Summary of First Sub-Research Question (RQa) and related factors

Co.	RQa: How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?	Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension
T	Absorptive capacity meta-routines confirmed at all units level in Company T. Efficiency in absorbing and assimilating knowledge may become the challenging factor	• Source of knowledge: customer • Decision maker: always done by Managing Director • Selection based on information from info. service agent	• Use of consultant when trust issue arisen	• Gatekeeper • translator	• Flexibility issue on team composition • Compliance to best practice standard requirement • Recruit new resource	• Venue to share knowledge • Decision made earlier since acquisition	• On-the-job Prototyping and training • Self-developed system to help with understanding	• Customer Relationship Management database • Knowledge transfer via codified doctrine • Venue to share, feedback, and update	• Customer satisfaction and feedback • Supplier performance database

Table 4.3: Summary of Second Sub-Research Question (RQb) and related factors

Co.	RQb: What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?	Exploratory Regimes			
		Agent role	**Behavioral Factor**	**Impact Factor**	**Process & Routines Factor**
A	The extent of knowledge transfer of Company A expands widely beyond the company's boundary. The transfer of new knowledge involves translating and transforming the transferred content into the language and context that suits the target recipients who have variations in background knowledge.	• Decision maker • Gatekeeper/ Translator ○ Language barrier ○ context conversion • Informant: trade negotiation and market trend update	• KPI as demotivation factor • Building of trust relationship • No blaming culture • Recognition (Monetary reward is not a motivational factor) • Shared vision • Leadership	• Customer demand • Use of prototype • Empowerment • Social relationship • Knowledge traits • Segregation of knowledge recipients • Knowledge transfer ○ Assisted by technology ○ Collaborative work environment ○ Knowledge spillover	• No evidence
B	As the role of being distributor, transferring knowledge goes beyond the company's boundary. It includes educating market and customers. Factors involving knowledge transfer go beyond the company's control environment	• Triggering points • Decision maker • Gatekeeper/ Translator ○ Use of common language • Knowledge codification	• Fear of asking questions in public ○ Size of knowledge transfer group • Learning mindset ○ Service mind attitude ○ Continuous learning ○ Habit for self-preparation for knowledge transfer ○ Passion of learning	• Use of prototypes • Knowledge spillover • Knowing recipient • Social relationship (with suppliers, professional networking and customers) • Feedback • Time to educate market • Measuring indexes	• Quality assurance process ○ Simulation process

(Continued)

Table 4.3 (Continued): Summary of Second Sub-Research Question (RQb) and related factors

Co.	RQb: What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?	Exploratory Regimes			
		Agent role	**Behavioral Factor**	**Impact Factor**	**Process & Routines Factor**
C	Since the responsibility of transfer from supplier falls to the designated team, compliance to the supplier's regulations is required. Supplier requires the team to have technical and commercial certifications, as well as having prototype unit for the formal transfer to occur	• Decision maker • Gatekeeper ○ Language barrier ○ Metaphor and analogy ○ Translating ○ Knowledge transfer	• KPI as demotivation factor ○ Stress ○ Turnover	• Technology-assisted transfer • Customer demand • Knowledge traits fit • Use of prototype • Empowerment • Customer Retention	• Feedback routines ○ Lesson-learned session ○ Evaluate performance • Measurement of success ○ Customer retention
D	The major factor that has impact on the new knowledge absorption is the knowledge transfer from supplier. Supplier plays the key role to trigger the need of new knowledge as well as supporting the prototype for the exploratory of knowledge gain. The second highest impact is the social relationship between the member of the team and the customers. Relationship is seen as an important factor to gain the competitive advantage	• Decision maker	• Motivation of thriving to be in business: Compliance with certification program • Trust from customer: prototyping helps gaining knowledge and build trust • Passion to learn	• Social Relationship • Prototype ○ Self-experimental learning • Technology-assisted knowledge transfer ○ Team communication ○ Knowledge transfer with customers ○ Online community • Product and Service Strategy • Measurement of success ○ Customer retention	• Collaborative learning using divide and conquer technique • Social relationship among team members

(Continued)

Table 4.3 (Continued): Summary of Second Sub-Research Question (RQb) and related factors

Co.	RQb: What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?	Exploratory Regimes			
		Agent role	**Behavioral Factor**	**Impact Factor**	**Process & Routines Factor**
M	Company M focuses on the equality and efficiency of knowledge development. It has limited resources and capacity. It has refined its approach on retaining the competency within the company while supporting growth as well as employees' knowledge development	• Decision maker • Gatekeeper/Translator	• Psychological safety ○ Fear of speaking/asking question in public • Trust and Respect: management does not trust his subordinates in presenting ideas	• Supplier enforcement: through certification program • Fit to knowledge traits: unfit knowledge will be rejected • Social relationship • Prototype • Repetitive assignment • Capability matching to task assignment • Open workspace • Outsourcing organization arrangement	• Knowledge screening routine • Feedback routine: on every steps of absorption

(Continued)

Table 4.3 (Continued): Summary of Second Sub-Research Question (RQb) and related factors

Co.	RQb: What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?	Exploratory Regimes			
		Agent role	**Behavioral Factor**	**Impact Factor**	**Process & Routines Factor**

T	Company T uses a very complex functional organization procedure to carry on knowledge absorption. Absorption involves everyone in the organization, leaving flexibility of being SME in doubt. This is why negative factors, like knowledge hoarding and communication barriers, do exist	• Knowledge source
		• Decision maker
		• Gatekeeper
		  ○ Transferring knowledge
		  ○ Translator
			• Communication barrier
			  ○ Fear of asking
			  ○ Language barrier
			• Passion, ambition, and determination
			• Recognition: Being a part of successful team
			• Monetary motivation
			• Challenge: thrive for new knowledge
			• Knowledge hoarding
			  ○ Incomplete and Legality
				• Prototyping
				• Knowledge stickiness, not transfer
				• Knowledge quality feedback from customer, project delay
				• Communication barrier
				• Customer Benefits as criteria for selection
				  ○ Reduce cost
				  ○ Increase satisfaction
				  ○ Increase productivity
				• Shared Vision
				• Measuring of Success Indexes
				  ○ Time spent on project: insufficient knowledge
					• Feedback routine
					• Check and balance routine for partner performance feedback

4.3 Cross-case Analysis and Summary of Findings

This section will find common patterns and themes across cases and will discuss factors influencing absorptive capacity meta-routines and exploratory regimes, answering the three research questions at a cross-case level of analysis.

4.3.1 Summary of Research Question: How do IT SMEs absorb new knowledge?

From data collection and analysis, it can be concluded that IT SMEs perform in a high-dynamic knowledge-intensive market and therefore they need to learn and re-learn often. From the analysis of first order coding as appeared in Table 4.1, second order coding is derived. It is found that organizational strategy and triggering factors impacted the recognition of the value of external knowledge; while organizational structure and mean and method of knowledge transfer impacted the efficacy of the transfer and transformation of knowledge. The result of second order coding is displayed in Table 4.4.

Table 4.4: Second order coding in cross-case analysis

1st order coding	Grouping of 1st Order Coding	Factor impacting absorptive capacity (2nd order coding)
• Focus strategy (Product line: A; Technology area: B; Supplier: D, M; Customer: C, T) • Type of IT SME (Distributor-DI: A, B; System Integrator-SI: C,T; Value-added reseller-VAR: D,M)	Organizational strategy	Recognizing the value of external knowledge
• Triggering point to absorption (Supplier/manufacturer: D, M; change of technology: A, B; Government regulations: B; Compliance requirement: B; Customer: C, T)	Triggering factors to absorption	
• Transfer boundary (Local: B, C, D, M, T; External to partner: A; Market educate: B) • Transfer Direction (External-inward transfer: A, B, C, D, M, T; Internal-outward transfer: A, B, C; Intra-team local transfer: A, B, C, M, T; Reverse transfer to supplier: C)	Knowledge transfer mean and method	Efficacy of the knowledge transfer and transformation
• Organizational form (Functional: A, T; Divisional: C, D; Mix: B, M) • Flexibility (Flexible: B, C, D; Rigid: A, M, T) • Delegations of decision making (Empowerment: A, B, C, D; Centralized: M, T)	Organizational structure ○ Flexible, Rigid, Flat ○ Empowerment, centralized decision making ○ Internal-outsourcing business model	

In order to provide an answer to the primary research question, a broad perspective on absorptive capacity is taken. Two overarching themes emerged during the cross-case analysis. These themes are ‘recognizing the value of external knowledge’ and ‘efficacy of knowledge transfer and transformation’. These two themes govern the initiation and the quality aspect of knowledge absorption.

The first theme, recognizing the value of external knowledge, focuses on organizational strategy and the decision that drives knowledge absorption. Two related subthemes i.e., organization strategy and triggering factor for absorption, emerge as relevant to explains the reason why new knowledge absorption is made.

The second theme, efficacy of knowledge transfer and transformation, focuses on factors that have an impact on the quality and effectiveness of knowledge transfer and transformation. It is found that organizational structure, and mean and method make a large contribution to the quality of knowledge transfer. Organizational structure is a contributing factor toward the quality of the transferring and transformation contexts.

4.3.1.1 Recognizing the value of external knowledge

4.3.1.1.1 The organizational strategy

Organizational strategy emerged as a key subtheme in cross-case analysis. Table 4.5 summarizes three key aspects of organizational strategy at each case level: SMEs type, triggering factors to absorption, and focus.

Table 4.5: Summary of strategies that impact new knowledge absorption

Company	**Type of IT SME***	**Triggering factor(s) to absorption strategy**	**Focus strategy**
A	DI	New technology	Product line
B	DI	New technology, Government regulation, standard compliance	Technology area
C	SI	Customer	Customer's Industry Sector
D	VAR	Supplier	Supplier/manufacturer
M	VAR	Supplier	Supplier/manufacturer
T	SI	Customer	No
*Three types of IT SME: Distributor (DI), System Integrator (SI), and Value-Added Reseller (VAR)			

Type of IT SME. Type of IT SME has an impact on knowledge absorption. Being an IT distributor (DI), the new technology must be learned and the new knowledge must be absorbed as soon as the new product is available in the market. The company

needs to stay ahead and perform the role of market educator. In this case, the absorption must be done quickly to serve the rapid need and to stay ahead of the competition.

For the System Integrator (SI) function, the time to absorb may not be as critical as for the distributor. The SI always performs according to a customer's demand. The knowledge to be absorbed can occur at some period of time after the release of technology. A common characteristic of the customers is that they need a proven technology with eliminated risk of implementing a new system. Time provides the opportunity for the industry to test a system and provide a response. Customers tend to listen to the comparison results from the information provider companies, such as Gartner, IDC, Forrester, etc. At the time of the absorption decision, the information is already abundantly available.

For the Value-Added Reseller (VAR), the company just follows what the supplier/manufacturer is releasing for the new technology. From the case analysis, Company D and Company T are the two Microsoft VARs. Their services are to help their customers receive the latest technology from Microsoft in an appropriate timeframe. Most customers require the new products only when it is quite stable and the known problematic issues are resolved. The VAR requires extensive testing of the new product before rolling out to its customer. The VAR receives extensive knowledge transfer support from the supplier through the certification compliance requirement program, which, in the case of Microsoft, is every 2 years. The VAR performs the testing of a new product release or upgrade through the lab setting before applying the new knowledge to its customer.

In terms of the risk associated with adopting new technology and knowledge, the DI seems to be a higher risk-bearer than the SI and VAR. Risk for the SI comes from integrating multiple products together, while a VAR possesses very low risk as the supplier/manufacturer has done extensive quality control prior to the release of new products or upgrades. The perceived value gains from the immediate acquiring of new knowledge are more valuable to the DI than to the SI and VAR. This is from the fact that the DI is on the upstream of the ecosystem value chain, while the SI and VAR are on the downstream of the chain. The DI acts as the knowledge contributor, compared to the SI and VAR who act more as the knowledge recipient. The knowledgeable product distributor and supplier will increase trustworthiness and confidence to the customer for the SI and VAR, respectively.

Time to absorption can be divided into 3 scales of late, moderately, and immediately. Table 4.6a explains these categories. Likewise, the risk of *not* absorbing the new knowledge appropriately when it is available can be divided into the 3 levels of low, moderate, and high. Table 4.6b provides the details. These scales are used for analysis within this entire section.

Table 4.6: Categorization of (a) Time to Absorption Scale, and (b) Risk level of not appropriately absorb new knowledge

Time to absorption	**Category Explanation**
Late	The company can wait until all information is available and there is demand from market
Moderately	The company can wait until more information is available
Immediately	The company decision to absorb is made when new knowledge is available

(a)

(Continued)

Table 4.6 (Continued): Categorization of (a) Time to Absorption Scale, and (b) Risk level of not appropriately absorb new knowledge

Risk of not appropriately absorbing new knowledge	**Category Explanation**
Low	The company can decide to absorb knowledge when they think they should
Moderate	The company can absorb new knowledge to stay in competition
High	The company must absorb the knowledge when it is readily available, otherwise there will be high impact on company survival from competition

(b)

Table 4.7 relates the Type of IT SME and the time to a new knowledge absorption decision. It also shows the risk of not absorbing new knowledge in time. The DI has high risk potential if the new knowledge comes and is not absorbed in time. The VAR will have a moderate risk as they need more information before applying the new knowledge to the customer. The SI has less urgency in new knowledge absorption as they need most of the information to be available before taking any actions. Figure 4.1, shows the relationship between the Type of IT SME as the direct variable which has an influence on absorptive capacity.

Table 4.7: Summary of Type of IT SME in relations to time and value of new knowledge absorption

Type of IT SME	**Time to absorb new knowledge when it is available**	**Risk of not appropriately absorb new knowledge**	**Perception of value gains from immediate acquiring of new knowledge absorption**
DI	Immediately	High	Knowledge contributor
SI	Late	Moderate	Knowledge recipient
VAR	Moderately	Low	Knowledge recipient

Source: Own elaboration

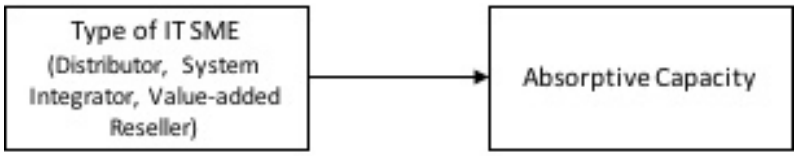


Figure 4.1: Type of IT SME has an influence on absorptive capacity

Triggering Factors. New knowledge comes from various sources. These sources are: (1) customer-initiated demand, (2) supplier updates or release of new products, (3) new technology trends, (4) government abiding rules and regulations, and (5) new standard compliance. Among these sources, the primary source of decision is customer demand. This factor is not entirely dependent on the type of IT SME, but it is also dependent on the product the SME is focusing on. For a distributor (DI), the decision is driven by the technology trend. For Value-Added Reseller (VAR), the technology supplier will have influence on the absorption. The VAR will have to prepare itself to be in ready mode through the absorption of the new knowledge. The customer will only have influence on when the knowledge will be applied. For the System Integrator (SI), where customer-centric is the main focus, the customer will have a high influence on the absorption decision. Table 4.8 displays the relationship of the types of IT SME and the triggering factors to absorption strategy with the time of absorption.

Table 4.8: Type of IT SME, triggering factors, and time to absorption

Type of IT SME	**Triggering factors**	**Time to absorption**
DI	Technology change	Immediate
SI	Customer	Late (Only when customer request for)
VAR	Supplier/manufacturer	Moderate (when supplier release new upgrade or product)

Triggering factors together with type of IT SME have and influence on absorption time. If a matrix which combines both the type of IT SME and the triggering factors to absorption strategy is drawn, the relationships would be as shown in Table 4.9. It can be concluded that the Type of IT SME, together with the specific triggering factor of an absorption strategy, have an impact on absorptive capacity. The relationship is displayed in Figure 4.2.

Table 4.9: Time to absorption matrix of the relations between type of IT SME and triggering factor to absorption strategy

Triggering factor / strategy / **SME Type**	**Customer**	**Supplier/ manufacturer**	**Technology change**	**Government regulations**	**Expansion into new area**
DI	Moderately	Moderately	Immediately	Moderately	Immediately
SI	Immediately	Later	Later	Immediately	Immediately
VAR	Moderately	Immediately	Later	Moderately	Immediately
Three levels of time of absorption Immediately: decision to absorption is made instantly Moderately: decision to absorption can be hold until more information is available Later: decision to absorption can be waited until all information is available					

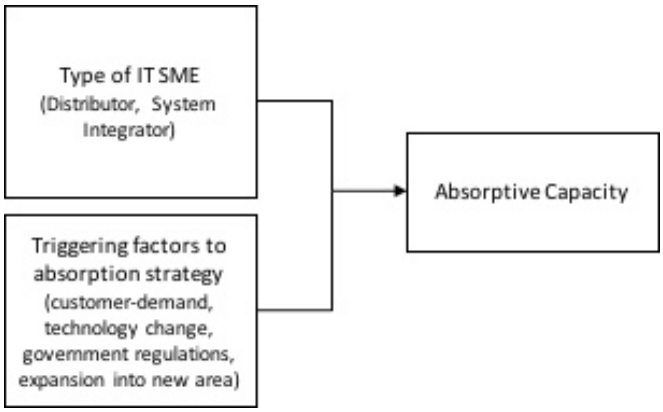


Figure 4.2: Relationships of type of IT SME and triggering factors on absorptive capacity

Focus strategy. Focus strategy is where the IT SME decides to focus its offering of products and services. This focus will limit the necessity to retain vastly different forms of knowledge. The benefit is that SMEs can become specialists in a certain product. However, the disadvantage is that there may be a chance that SMEs cannot alone offer the products or services to customers from their in-house resources. For those projects that require integration with some other non-carrying product line, partnering with other companies may be required.

The focus strategy is always based on a number of other strategies. First, the typical focus is on a certain product type. For example, Company A is focusing their offering on security surveillance camera (CCTV) products. They offer multiple brands of CCTV, but they will never offer another line of product or services from other areas. This strategy is called the product-focused strategy.

The second type of focus strategy regards the line of business and a certain technical area. For example, Company B is focusing its product offering line on IT Security. With information from their web site, they offer various security solutions

ranging from a firewall to a caching server, virus protection, e-mail spamming protection, digital loss prevention, digital right management system, etc. The company in this category must have depth and breadth of knowledge in the area of IT security.

The third type of focus strategy regards the customer/industry sector. A company in this category will focus its product offering in the sector with which they are familiar. For example, Company C focuses its products and services offering as a Telecom and Internet Service Provider. Their offered products and services are clustered around the telecom and data communication network, and all necessary equipment for communication. The company focusing on customer/ industry sector will have in-depth knowledge of the industry.

The fourth type of focus strategy regards the product supplier. The company in this category is sometimes referred to as Value Added reseller (VAR). They are on a partner channel for some certain product manufacturers or supplier. For example, Company M and Company D are Microsoft's channel partners. They perform the supply of products and services for Microsoft solutions, including the Microsoft e-mail and messaging system, the Microsoft active directory service, Microsoft web and workflow services, etc.

The final type of focus strategy is not to focus on any particular products and services, but to follow the customer's demand. The company using this strategy will source for products and services from their known multiple distributors. They perform product installation and integration services to make sure the products work together seamlessly and smoothly. The company in this category requires having great depth

and multiple product knowledge. It is likely that they will have a large network of partners.

It can be concluded that the focus strategy has an impact on absorptive capacity. The influence between focusing strategy and time to absorption is reported in Table 4.10.

Table 4.10: Time to absorption for focus strategy company

Company has specific focus on	Time to absorb new technology
Product	Immediate
Customer industry	Late
Supplier	Moderate
Technology area	Immediate
No focus	Late

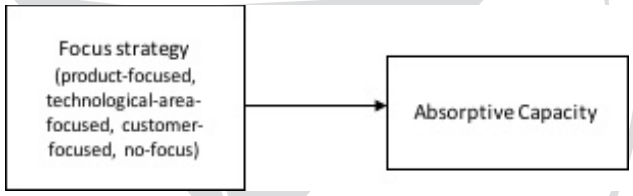


Figure 4.3: Focus Strategy has an influence on absorptive capacity

The focus strategy has a direct impact on absorptive capacity. Focusing on a product or technical area will force the company to immediately absorb new knowledge when there is new technology released regarding that product. Focusing on a supplier will force the company to absorb new knowledge when the supplier releases a new upgrade or a new product. A customer focus or no focus strategy will only start the absorption when there's an explicit need from the customer; otherwise, the company may choose to ignore the new knowledge.

When looking at the impact on new knowledge absorption of a focus strategy and the triggering factor of an absorption strategy, it is found that both are tightly related to the decision to make the absorption. The decision that is driven by the change of technology will highly impact the company that is focused on a product or technical area, but is less likely or only moderately likely to impact a company that is supplier-focused, customer-focused, or has no-focus. The decision that is driven by the upgrade or release of a product from a supplier will highly impact the company that is focused on providing services connected to the product of that supplier, but moderately impacts a product or technology-focused company. The decision that is driven by customer demand will highly impact the company that focuses their service to primarily serve customer needs, but moderately impacts the supplier-focused company, and is less likely to impact the product or technology-focused company. A company's decision to expand into new markets has a high impact on knowledge absorption for the product-focused and technology-focused company, but moderate impact on the supplier-focused company, and less impact on the customer-focused or no-focus company.

Government regulation has moderate or less impact on the focus strategy company. This is because the time it takes for a government regulation to be legally in effect allows time for the company to absorb the new knowledge. Table 4.11 shows the relationship among these variables. Figure 4.4 shows the impact relationship between the focus strategy and the combination strategy of a focus strategy and triggering factors to absorptive capacity.

Table 4.11: Time to absorption matrix of focus strategy and the relationship with triggering factors to absorption strategy

Focus Strategy	Absorption decision when new knowledge is available	Triggering factors to absorption strategy				
		Customer demand	Supplier release	Technology change	Government regulations	Expand into new area
Product-focused	Immediately	Moderately	Moderately	Immediately	Moderately	Immediately
Technology-area-focused	Immediately	Moderately	Moderately	Immediately	Moderately	Immediately
Supplier-focused	Moderately	Later	Immediately	Moderately	Later	Moderately
Customer-focused	Later	Immediately	Later	Later	Later	Later
No focus	Later	Immediately	Later	Later	Later	Later
Three levels of time of absorption Immediately: decision to absorption is made instantly Moderately: decision to absorption can be wait until more information is available Later: decision to absorption can be waited until all information is available						

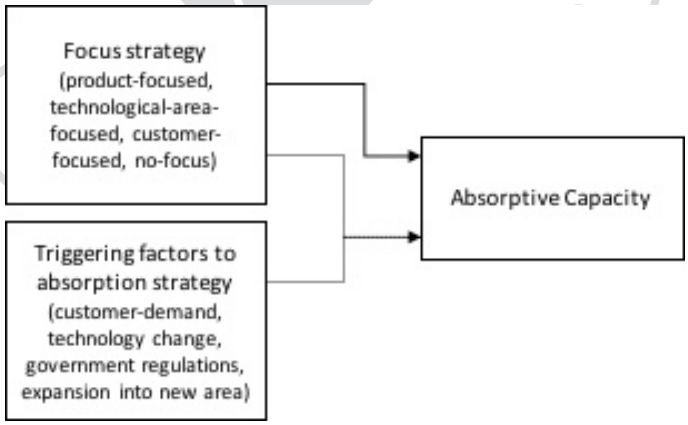


Figure 4.4: Impact variables of focus strategy and the Triggering factors to the absorptive capacity

4.3.1.1.2 Summary of recognizing the value of external knowledge

Figure 4.5 summarizes the 'recognizing the value of external knowledge' emerged theme. Influencing factors are reported, starting from the type of IT SME, which is the influencing factor that has an impact on the absorptive capacity. These influencing factors, when combining together, have an impact on the decision to absorb new knowledge.

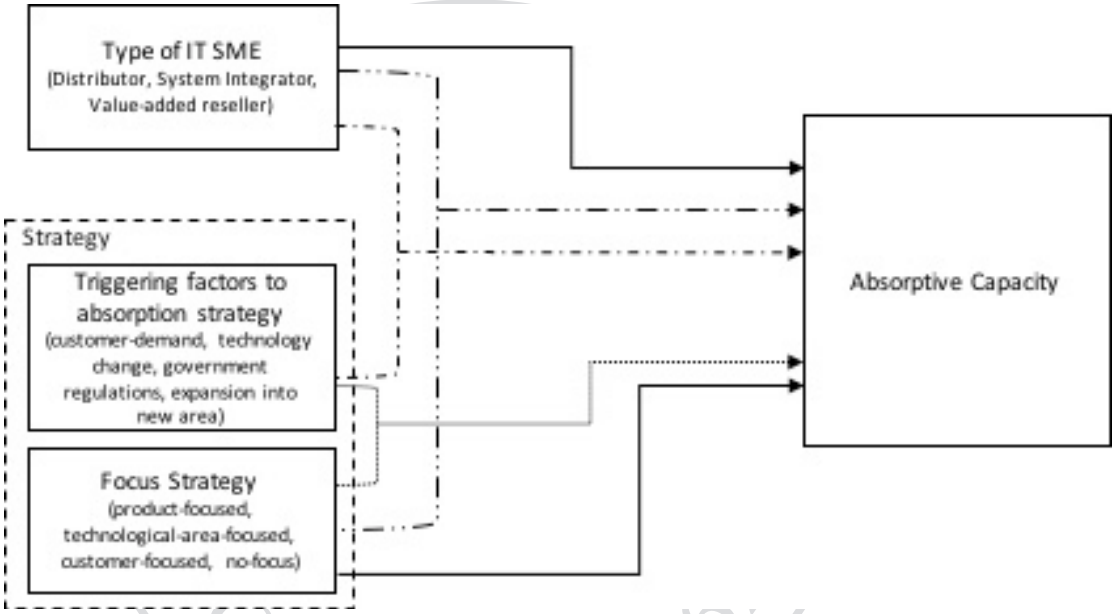


Figure 4.5: Type of IT SME and strategies which impact absorptive capacity

When these influencing factors are put together, they will form a matrix. The decision to knowledge absorption is reported in Table 4.12.

Table 4.12: Decision to knowledge absorption

Decision to knowledge absorption	**Description**
Highly likely	Company will perform new knowledge absorption facing certain risks from incomplete information
Most likely	Company will perform new knowledge absorption at a certain time in the near future to eliminate risks as much as possible
Likely	Company will perform new knowledge absorption when it is necessary

Unlikely	Company may not perform new knowledge absorption unless to catch up with competitor
Very unlikely	Company may not perform new knowledge absorption, unless mandatory

The degree of likelihood to absorption is derived from the time to absorption matrix, see Table 4.13.

Table 4.13: Degree of absorption matrix

		Time to absorption of factor 1		
		Immediately	**Moderately**	**Late**
Time to absorption of factor 2	**Immediately**	Highly likely	Most likely	Likely
	Moderately	Most likely	Likely	Unlikely
	Late	Likely	Unlikely	Very unlikely

For example, let's determine the time to absorption of new knowledge for company A, against the source that are from the demand of a customer. In this case, the type of Company A is a distributor (DI). When new knowledge is available in the market, Company A will immediately acquire the knowledge. However, the triggering factor source is from a customer, which is considered as a fate for absorption. This is because when the information is available to the customer, that information is considered not-so-new to the industry. Therefore, it is "Likely" that Company A will absorb the new knowledge. Figure 4.6 illustrates the decision matrix of new knowledge absorption.

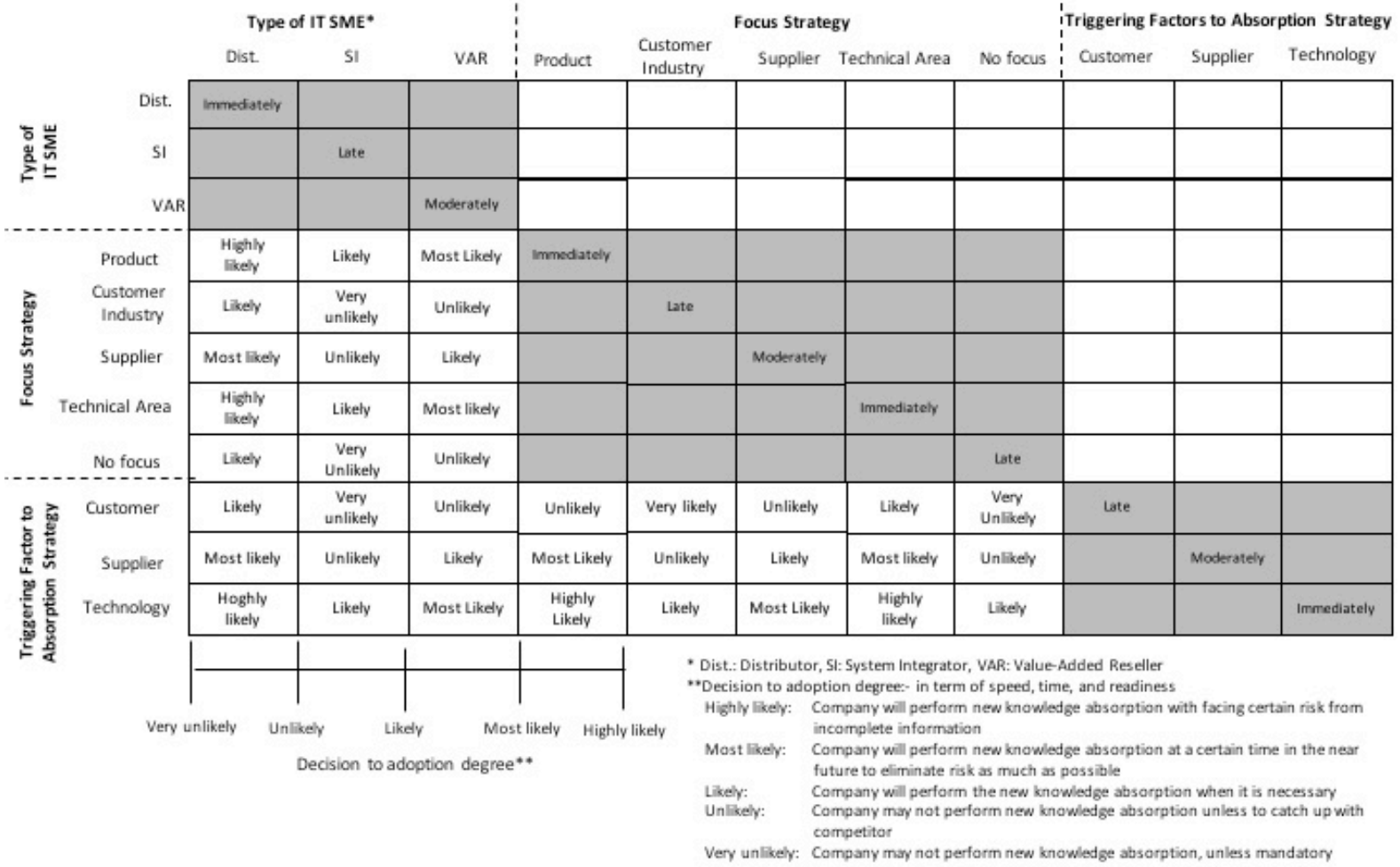


Figure 4.6: Decision matrix on new knowledge absorption

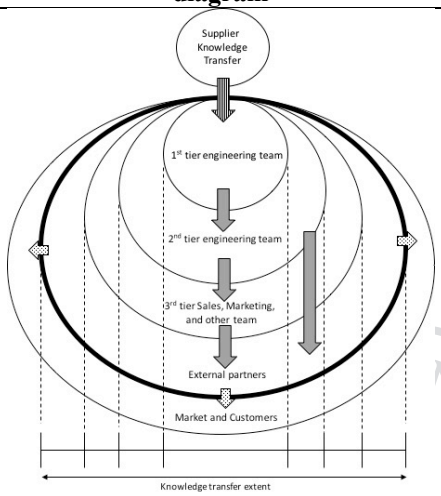
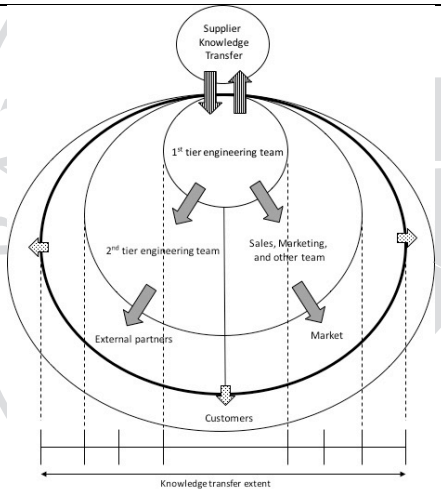
4.3.1.2 Efficacy of knowledge transfer and transformation

Efficacy of knowledge transfer comes from two factors, (1) the mean and method in terms of organizational knowledge transfer boundary and direction; and (2) the organizational structure, as explained in the following sections.

4.3.1.2.1 Knowledge transfer mean and method

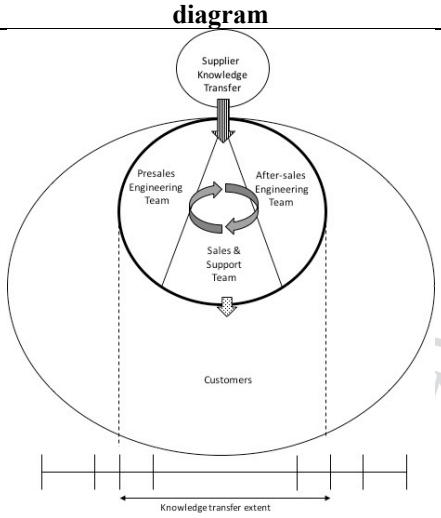
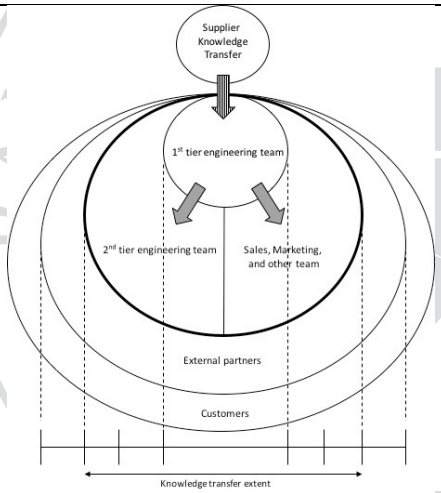
Organizational knowledge transfer boundary: The first factor that determines the transfer mean and method is the organizational boundary. The boundary will defy the effort, the complication, and effectiveness (Beckett & Hyland, 2011; Cranefield & Yoong, 2007; Rosenkopf & Nerkar, 2001) of the transfer. From the case study analysis, it came out that company boundaries had no fixed forms. Table 4.14 lists the knowledge transfer boundary of each case study extracted from the interview context. Examining the characteristic of knowledge transfer, number of multiple-transfer indicates the level of complexity involved. Based on my interpretation, a multiple-transfer denotes the transfer of knowledge from one team to another. The number of multiple-transfer has impact on the efficacy of the transfer (Cranefield & Yoong, 2007).

Table 4.14: Knowledge transfer boundary extent

Company	Knowledge transfer boundary-extent diagram	Summary of knowledge transfer boundary extent
A		Company A knowledge transfer extent starts from the acquisition from the supplier. Company A sends a few engineers to formal training sessions. These engineers will come back and assimilate the knowledge to the rest of organization by starting from the technical transfer to other engineers, then a customized context to other teams. Company A uses external partners as their external outsourcing workforce. The assimilation of knowledge will cover these partners as well. Hence the extent spans beyond the physical boundary of the company. From the illustrated boundary-extended diagram, there are 5 knowledge transfers, which is regarded as moderately complex.
B		Company B is a distributor in the IT Security area. They are involved with top-of-the-line security products with state-of-the-art innovation and novelty. They are working closely with the supplier, with extensive knowledge transfer that is very new to the market. They have a few engineers to receive first-hand knowledge transfer from the supplier. These engineers will later re-transfer the captured knowledge to other engineers and the back-office support team. Since Company B's scope of knowledge transfer includes educating their partners in their partner network and also educating the market, the transfer extent goes beyond the physical boundary of the company. The recipient teams that are handling the knowledge transfer are kept small and dynamics for the effectiveness of the transfer and understanding.

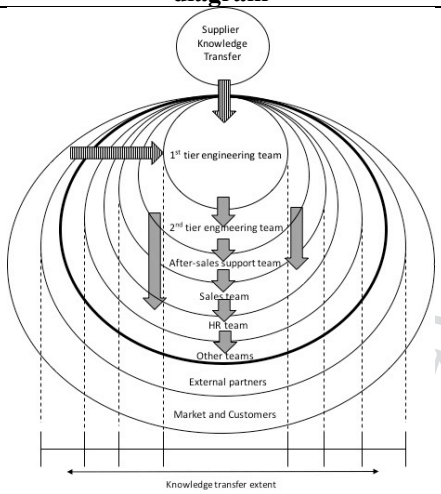
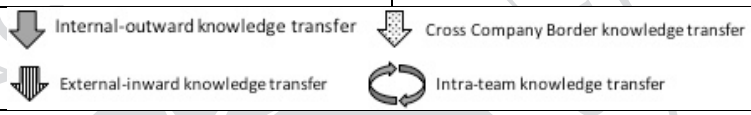
(Continued)

Table 4.14 (Continued): Knowledge transfer boundary extent

Company	Knowledge transfer boundary-extent diagram	Summary of knowledge transfer boundary extent
C and D		Companies C and Company D are highly flexible and very agile in responding to knowledge transfer and absorption. The team to handle the knowledge transfer from the supplier is formed at the very early stage of absorption. Every discipline involved is onboard the team to receive the knowledge. The steps of re-transferring to other disciplines are eliminated. By doing so, the complexity of assimilation is reduced to a single knowledge transfer.
M		Company M has moderate complexity in knowledge assimilation and transformation. The transfer starts from the external-inward transfer from supplier to the first-tier group of engineers. Once the knowledge is captured, transfer re-occurs at the second tier. The back-office support team will also learn together with the second-tier group. This reduces the steps and complexity of knowledge transfer. The complexity of the transfer is reduced to 2-3 multiple-transfer.

(Continued)

Table 4.14 (Continued): Knowledge transfer boundary extent

Company	Knowledge transfer boundary-extent diagram	Summary of knowledge transfer boundary extent
T		Company T is a highly complex organization. In absorption of new knowledge, the whole organization has to be involved. The formation of the team and the transfer mechanism is very rigid. It requires 9 multiple-transfer of knowledge among various sections in different departments in terms of assimilating and transforming of new knowledge.
		

Knowledge transfer direction: The second factor under the mean and method that determines the efficacy of knowledge transfer and transformation is the knowledge transfer direction. The number of knowledge transfer hops can be used as the indicator for effective transfer. The lesser number of the hop means the less crossing of inter-disciplinary boundaries.

The complex organization tends to have multiple knowledge transfers across multi-disciplinary teams, while the less complex organizational structure requires less knowledge transfer hops. The inter-disciplinary transfer will involve other factors, which may include the use of a translator, the use of a common language, the use of metaphor and analogy, and the coordination and socialization among the team members during the transfer. The effective transfer organization will have less knowledge transfer hops across multi-disciplinary teams.

From one of the case studies (Company C) that has a very high agility team assigned since the early phase of new knowledge absorption, it is found that involving inter-disciplinary individuals in this early phase increases the efficacy of learning and reduces the conflict of knowledge hoarding, since all individuals have participated together in learning and sharing since the beginning of the absorption process.

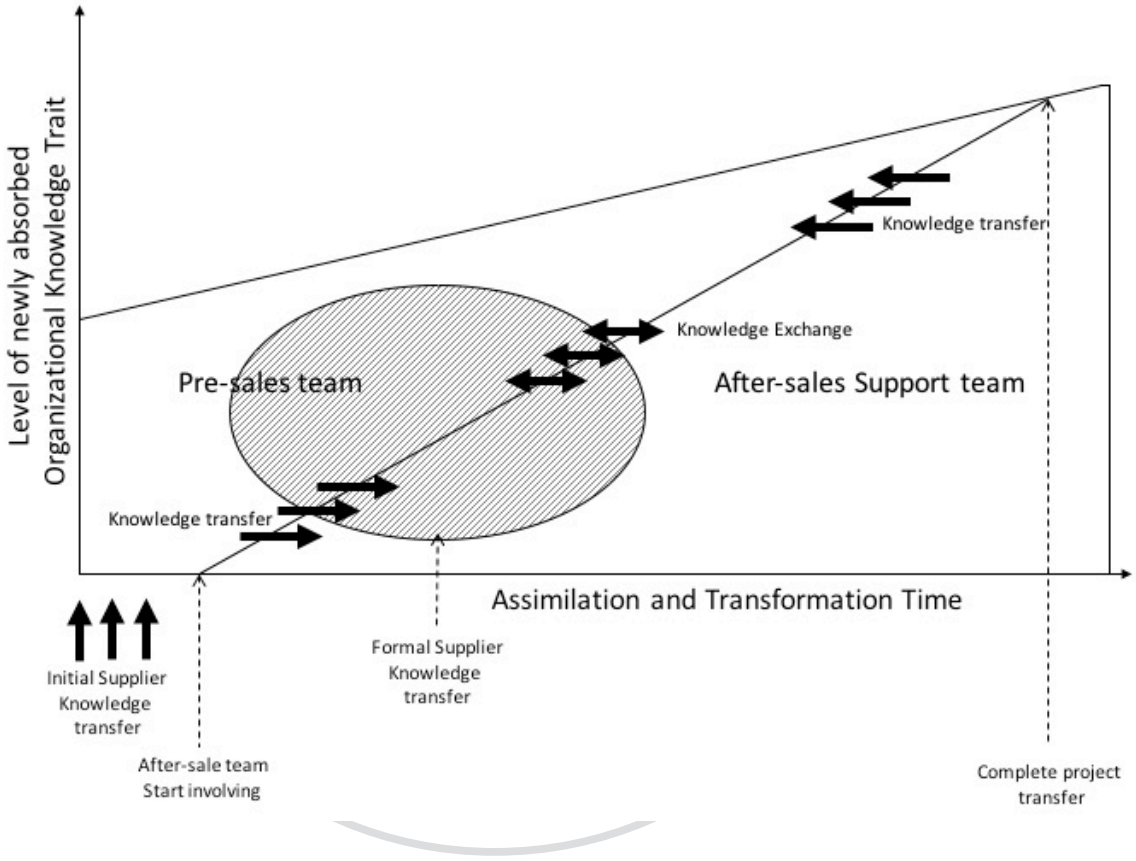


Figure 4.7: Level of knowledge assimilated and transformed, involving multiple-disciplinary members since early phase of the transfer in high knowledge transfer efficacy organization

Figure 4.7 illustrates how the knowledge is assimilated and transformed in the high efficacy knowledge transfer organization, which is represented by the case of Company C and D. In the beginning when the value of the new knowledge is realized,

the initial foundation of knowledge is being fed to the team in the form of public information. Once the decision is made for absorption, the official transfer by the supplier is given. At this time, an all involving multi-disciplinary team is formed for the direct absorption from the supplier with first-hand knowledge. At this stage, both explicit and tacit knowledge are transferred. The explicit comes from the training materials or searched information, while the tacit comes from the practice of using prototyping in the lab setting environment.

During the course of assimilating and transforming knowledge, knowledge is exchanged between the multi-disciplinary team openly and freely. This ensures the knowledge gets transferred from initiating team to the final exploitation team. Providing feedback is shown during the transfer process.

During the knowledge transformation, organizational knowledge increases. This is the result of the collective learning from individual, into team learning, into organizational learning. At the end, the new transformed knowledge will be exploited to gain competitive advantage for the organization.

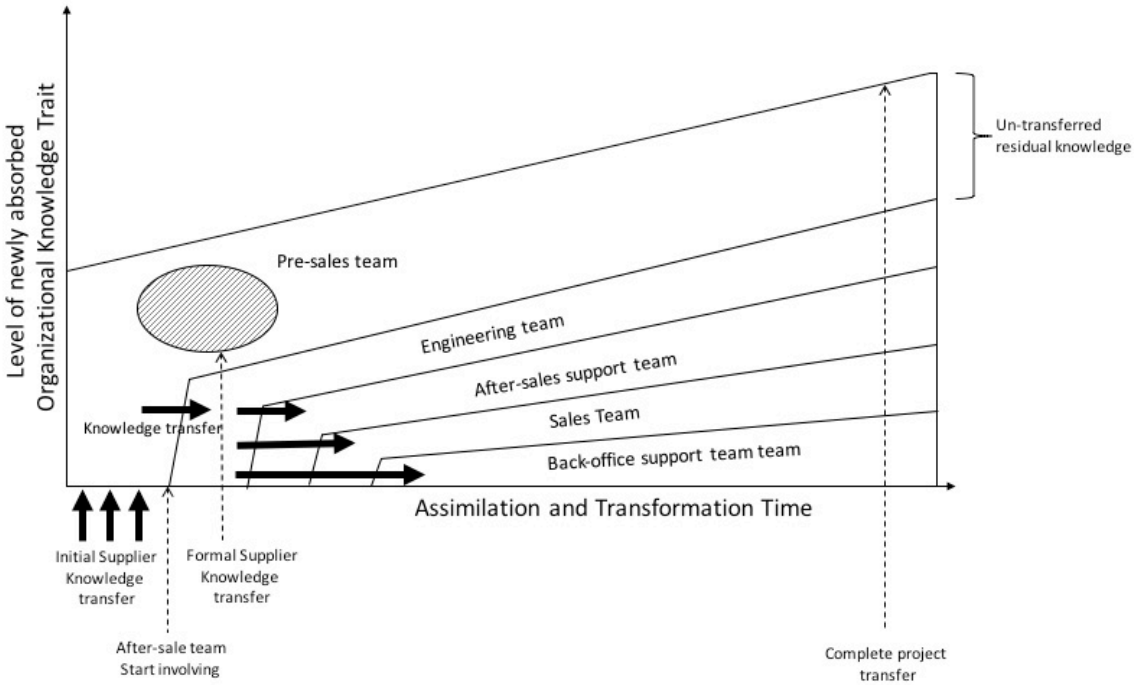


Figure 4.8: Knowledge transfer in low efficacy highly complex organization

In contrast to the illustration of knowledge transfer in the high efficacy knowledge transfer organization, Figure 4.8 illustrates the knowledge transfer in the low efficacy knowledge transfer organization. The low efficacy is inherited from the complex organizational setting. Knowledge needs to be transferred across multiple borders of multi-disciplinary teams.

In this case, when an organization decides to absorb new knowledge, a request for support of knowledge transfer from the supplier is initiated. The transfer involves the originating team's idea, the first-tier team. Once the transfer is completed, the first-tier knowledge absorbed team is to transfer the knowledge to the second-tier team; then the second-tier team will transfer to the third-tier team. When the transfer is required for the back-office support team, the first or second-tier team will have to re-transfer the knowledge again and again until all involved teams receive the transfer.

Multiple transfers result in the consumption of time and resources. These multiple transfers characteristic prevail in all the 6 companies, particularly company T and A. However, company B and M face lower degree of complication.

It is quite normal that knowledge hoarding is an issue in this type or organization. Not all knowledge is transferred to other teams. This results in the first-tier team having 'unshared' knowledge. The indication of hoarding emerges when the customer starts to contact the first-tier team directly, rather than the direct after-sales support team. This is because the customer knows that the first-tier team who has been involved with them since the beginning of the project implementation still has the in-depth knowledge about the specific configuration of that customer.

Knowledge hoarding comes with risk. Un-transferred knowledge still resides in the head of the first-tier engineers. If they leave the organization, the knowledge leaves with them. The organization having issues such as this requires good systems to archive explicit knowledge, good processes to ensure the documenting of this knowledge, and a good knowledge management program to retain the tacit knowledge within the organization.

4.3.1.2.2 Organizational structure.

According to Van den Bosch, Volberda, and de Boer (1999), there are 3 types of organizational forms—functional, divisional, and matrix formations. The functional form divides the organizational functions into departments, with each department having its own functionality to perform. The organization that uses the functional form aims to focus on efficiency in managing resources. The second form is the divisional form. This form of organization groups the relevant functions required to perform an activity together. This formation may not yield the highest efficiency in

managing resources, as does the functional form, but offers higher flexibility, which is the key to agility. The matrix formation combines the advantages of both formations. There is a hierarchy of authority involved, as in the functional formation, but as in the divisional formation, the matrix formation also contains the specialization of being flexible when needed for agility.

From the case studies, Companies B and M are organized in a matrix form. There are certain groups of engineers that handle the knowledge transfer from outside and within the company. These groups are formed at the time the transfer is to happen. Companies A and T show a strong functional form. They have explicit departments and interface barriers between departments. The transfer involves a few people, and these people are responsible throughout the transfer and absorption process. Companies C and D organize using the divisional formation. In Company C, they divide the organization according to the customer's business industry. Each division has all necessary disciplines and skills that are needed to perform knowledge absorption. Company D is very small. They enjoy being small, with everybody grouping together into a single team with high agility to serve the customers.

Table 4.15: Organizational structure and level of flexibility on knowledge absorption

Company	**Functional structure***	**Level of flexibility on knowledge absorption****	**Evidence from interview transcripts**
A	Functional	Rigid	"What I have under me are three sections. Solution providers providing installation and project management services. Distribution services distributing products through our dealers. The last portion is the e-commerce" (Managing Director, Thai, Male)

(Continued)

Table 4.15 (Continued): Organizational structure and level of flexibility on knowledge absorption

Company	Functional structure*	Level of flexibility on knowledge absorption**	Evidence from interview transcripts
B	Mix	Flexible	"We have responsible engineers who will take care of 2 to 3 products. These engineers will be responsible to learn from the product owner, and will be certified according to the requirement from the supplier" (Managing Director, Thai, Male)
C	Divisional	Highly flexible	"The knowledge sharing is organized within the team. The team will decide who is to perform what and schedule the sharing. There is sharing session occurring almost every week" (Managing Director, Thai, Male)
D	Divisional	Highly flexible	"I will assign technical engineer to set up the lab and perform the test" (Managing Director, Thai, Male) "I have freedom to set up the lab at my home. When it comes to a certain point where I might encounter the problem, I will come and discuss with the MD" (engineer, Thai, Male)
M	Mix	Flexible	"For the large company, each person will be assigned specifically to a certain area of responsibility. Being here, you have to work in every area and have to conquer them" (Sales, Thai, Male)
T	Functional	Rigid	"Lead engineer will perform the transfer of knowledge to others within the team" (Managing Director, Thai, Male) "To eliminate risk of knowledge transfer, a single team is handled a project from beginning to end… HR will facilitate the training of both non-technical and technical" (Engineer, Thai, Male) "MD is the decision maker in every detail in this company" (Finance Manager, Thai, Female)

*Functional structure classification is based on the classification by Van den Bosch et al. (1999)
**Level of flexibility: Highly flexible-the member of the team can act on their own to absorb new knowledge; flexible-member of the team have some flexibility in absorbing the new knowledge but require some form of authorization; rigid-centralized the decision-making process and all actions must be approved

From Table 4.15, the best organizational structure for an IT SME appears to be the divisional formation, followed by the mix, leaving the functional formation as the least efficient method to handle the absorption. There is a relationship between the

type of organizational formation and the flexibility in handling the transfer and the transformation of new knowledge.

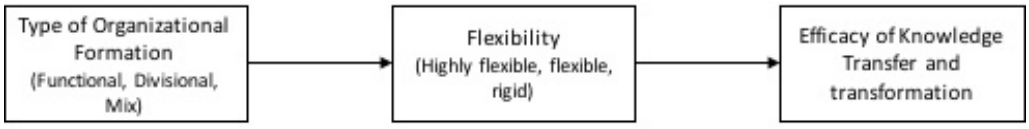


Figure 4.9: Type of organizational structure with relation to flexibility in absorption which impact on efficacy of knowledge transfer and transformation

4.3.2 Summary of Sub-Research Question 1 (RQa): How do Absorptive Capacity Meta-routines explain the absorption of new knowledge in IT SMEs?

All 8 stages of absorptive capacity meta-routines are explored in detail. The relevant variable factors, which have impacts on each step, are listed in Table 4.3. From the table, all factors are consolidated across all cases. Occurrences are counted to calculate the weight. The results are shown in Table 4.16 as follow.

Table 4.16: Cross-case factors which have an impact on absorptive capacity meta-routines

Identifying and recognizing value of externally generated knowledge	Learning from and with partners, suppliers, customers, and consultants	Transferring knowledge back to the organization	Facilitating variations	Managing internal selection regimes	Sharing knowledge and superior practices across the organization	Reflecting, updating, and replicating	Managing adaptive tension

• Source of knowledge
  ○ Supplier push (new product, new upgrade)
  ○ Customer pull
  ○ New technology
  ○ Government regulations
  ○ Competitor
  ○ Standard compliance
• Decision Maker
	• Social relationship building with supplier
	• Use of external consultant
		• Prototyping
		  ○ Lab setting for exploring new knowledge
		  ○ Self-learning from online material
		• Put up a lead team
		  ○ Gatekeeper
		  ○ Advocates
		  ○ Special/ Default
			• Knowledge Transfer Space
			  ○ Venue for knowledge dissemination
			  ○ Open space for free flow of knowledge
			  ○ Technology-assisted transferring venue
			• Knowledge transfer agility
			  ○ Empowerment
			  ○ Flexibility
				• Matching knowledge traits
				• Critical consideration
				  ○ Quick time to market
				  ○ Market penetration
				• Decision characteristics
				  ○ Decision making done in earlier phase
				  ○ Compliance to best practice
					• Explicit knowledge codification and systemic
					• Knowledge transfer technique
					  ○ On-the-job training, self-pace learning
						• Knowledge management practices
						  ○ Venue to share application result
						  ○ Lessons learned session
						  ○ Feedback
							• Competitive advantage measuring indices
							  ○ Competitor analysis
							  ○ Customer satisfaction
							  ○ Customer retention
							  ○ Supplier performance analysis
							• Knowledge spillover concern

Table 4.17: AC Meta-routines and counting scale of occurrences

AC Meta-routines	Consolidated factors (2nd order coding)	1st order coding	Presence of factors for company and counting scale											
			A		B		C		D		M		T	
Identifying and recognizing value of externally generated knowledge	Source of knowledge	• Supplier push	X	6		4		2	X	2	X	2		2
		• Customer (demand pull)	X				X						X	
		• Technology shift	X		X									
		• Government regulations	X		X									
		• Compliance			X									
		• Competitor move	X											
	Decision Maker	• Single decision maker	X		X				X		X		X	
		• Panel of decision makers					X							
Learning from and with partners, suppliers, customers, and consultants	Social relationship building with supplier	• Supplier support on knowledge transfer	X	1	X	2	X	1		2		2	X	3
		• Self-initiated knowledge transfer							X		X			
	Use of external consultant	• Hired consultant											X	
		• Information services Referential			X								X	
Transferring knowledge back to the organization	Prototyping	• Lab setting	X	2	X	2	X	2	X	3	X	3		1
		• Self-learning from online training materials							X		X			
	Put up a lead team	• Special Advocates					X							
		• Default team	X		X				X		X		X	

(Continued)

Table 4.17 (Continued): AC Meta-routines and counting scale of occurrences (Source: Own elaboration)

AC Meta-routines	Consolidated factors (2nd order coding)	1st order coding	Presence of factors for company and counting scale													
			A		B		C		D		M		T			
Facilitating variations	Knowledge transfer agility	• Empowerment			X		X									
		• Flexibility					X		X				X			
		• Agility							X							
		• Recruit new resources											X			
	Knowledge transfer space	• Providing venue for knowledge dissemination	X	1		1		2		2	X	3	X	3		
		• Open space for knowledge flow									X					
		• Technology-assisted transferring venue									X					
Managing internal selection regimes	Critical consideration	• Quick time to market	X													
		• Market penetration	X													
	Matching knowledge trait	• Knowledge traits fit/mapping		2		1		0	X	1	X	1		2		
	Decision characteristic	• Decision making done in earlier stage			X								X			
		• Compliance to best practice											X			
Sharing knowledge and superior practices across the organization	Explicit knowledge codification and systemic	• Knowledge-based database system	X													
		• Development of knowledge transfer document		1	X	1	X	1	X	1		0		1		
	Knowledge transfer technique	• On-the-job prototyping/training											X			

(Continued)

Table 4.17 (Continued): AC Meta-routines and counting scale of occurrences

AC Meta-routines	**Consolidated factors (2nd order coding)**	• **1st order coding**	**Presence of factors for company and counting scale**											
			A		**B**		**C**		**D**		**M**		**T**	
Reflecting, updating, and replicating	Knowledge Management practices	• Venue to share result/knowledge	X	3	X	1		2		2		2	X	2
		• Knowledge sharing session	X				X		X		X		X	
		• Feedback routines	X				X		X		X			
Managing adaptive tension	Competitive advantage measuring indices	• Customer satisfaction	X	2	X	3		1		1		1		2
		• Customer retention			X		X						X	
		• Supplier performance preferences									X			
		• Supplier performance analysis											X	
		• Competitor analysis	X						X					
		• Knowledge spillover			X									
Total counted scale				**15**		**14**		**11**		**14**		**14**		**15**

Table 4.18 combines occurrences of absorptive capacity meta-routines per each case study with meta-routines explored from literature review as demonstrated in Table 2.25.

Table 4.18: The number of occurrences in absorptive capacity meta-routines with literature review

Absorptive Capacity Meta-Routines	**A**	**B**	**C**	**M**	**T**	**Avg.**	**Lit. Rev.**
Identifying and recognizing value of externally generated knowledge	6	4	2	2	2	3.00	17
Learning from and with partners, suppliers, customers, and consultants	1	2	1	2	3	1.83	13
Transferring knowledge back to the organization	2	2	2	3	1	2.17	11
Facilitating variations	1	1	2	3	4	2.17	7
Managing internal selection regimes	2	1	0	1	1	1.00	7
Sharing knowledge and superior practices across the organization	1	1	1	0	1	0.83	7
Reflecting, updating, and replicating	3	1	2	2	2	2.00	11
Managing adaptive tension	2	3	1	1	2	1.67	12
Total Summary	15	14	11	14	15	14.67	85

Figure 4.10 shows the distribution of meta-routines across case studies. It has been noted that the score for ‘Managing internal selection regime’ and ‘Sharing knowledge and superior practices across the organization’ are lower and not significant when compared to other absorptive capacity meta-routines scores.

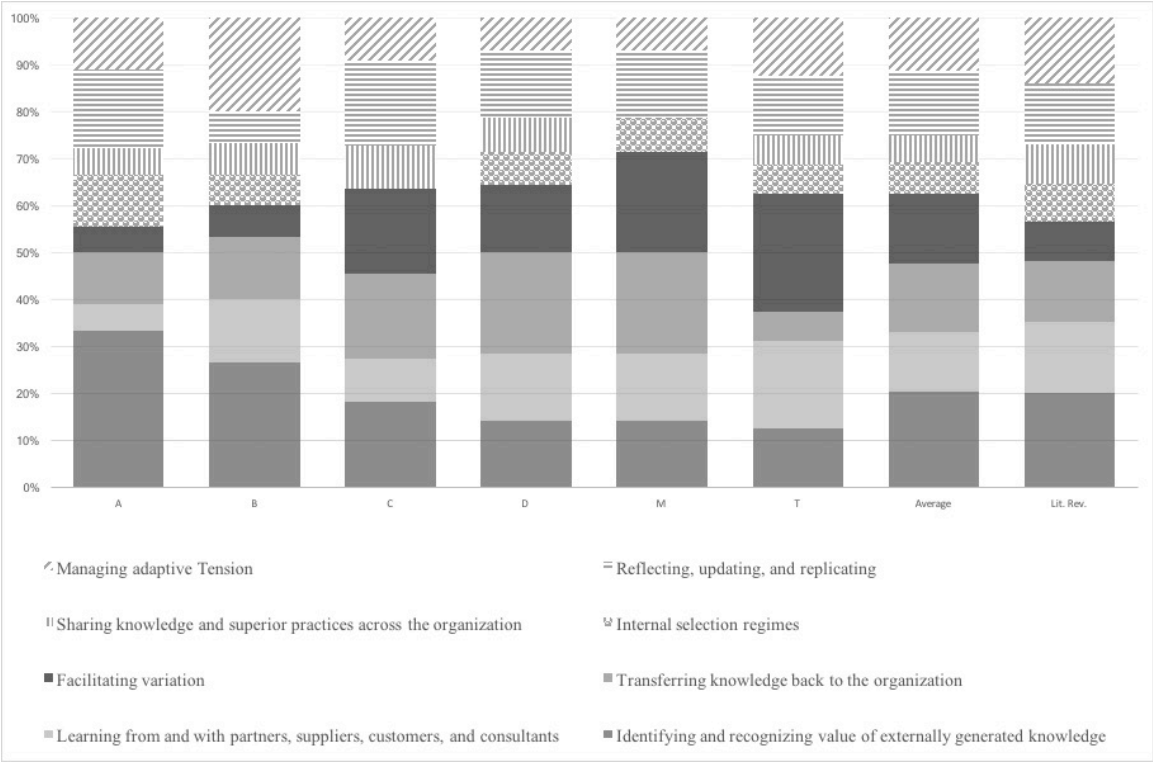


Figure 4.10: Distribution of weighted occurrences of absorptive capacity meta-routines across all case studies

From the analysis of data, it came out that in IT SMEs, the highest significant of meta-routines are on “Transferring knowledge back to the organization” and “Facilitating variations”. Since these two meta-routines involve capital expenditure and resource allocations, it is no surprise that the focus was on them. Follow a summary per each stage of meta-routines.

Identifying and recognizing value of externally generated knowledge. The most crucial factors that determine the core activity are the sources of knowledge and the decision maker. The sources of knowledge are from supplier push (new product or new upgrade), the customer pull, the new technology shift, the government regulation,

the competitor, and the standard compliance. These sources trigger the absorption process in IT SMEs.

The second factor to new knowledge absorption decision making regards the decision maker. IT SMEs rely for a decision solely on the top executive, namely the founder and owner of the company.

Learning from and with partners, suppliers, customers, and consultants. Social relationships with suppliers and other stakeholders are very important to get support and ensure the transfer. With strong relationships, the knowledge gets transferred from individual stakeholders via social relations to the designated individual of the company who is responsible for the transfer.

Preliminary transfer from external stakeholders starts by searching for information from the public domain. Once the decision is made for absorption, either by the company itself deciding to market the new product or by the customer showing a strong interest to commit, the official support and transfer from stakeholders will follow quickly. From collected evidence, all the six companies from the case studies depend on support from their suppliers when liaising with their customers. They confirmed that good socio-relationships with their suppliers help them get better support.

Transferring knowledge back to the organization. In this step, the only factor is prototyping. It is essential for IT SMEs; transferring the knowledge from outside into the company requires the use of prototyping. Prototyping will help bring out both the explicit technical knowledge and the hidden tacit knowledge. Prototyping simulates the actual environment of the system when being implemented, and will give an insight into how the system will operate and how t problems may occur, which gives

a head start on how to handle the problem when encountered in the actual implementation. All the six cases need support on prototyping from their suppliers. In the past, the supplier could sell the prototyping unit, and it was a mandatory requirement to groom the engineers with knowledge and real-world experiences. At the present time, the prototype is available for borrowing. The companies do not have to buy the unit as before.

Facilitating variations. The first crucial component of this meta-routine is the space to share and transfer knowledge. The space can be physical or virtual, and can be a dedicated place or a meeting event. All the companies in the case studies use their weekly meetings as the venue to share and learn from one another. One of the cases uses the coaching and mentoring technique to ensure positive conversation and create a knowledge sharing environment.

The transfer of knowledge does not just happen at the meeting or sharing venue; the transfer can happen immediately around the workspace. All companies in the case studies, except Company D which does not have permanent physical office, organize their workspaces into an open-space scheme, where all the thoughts occurring during the normal working day can be expressed and heard by the rest of the team. The transfer occurs right at that instant. Discussion can occur freely and immediately in the open space.

Another space that helps the transfer and has become a popular mean of transfer is the use of virtual space. The technology helps bridge distance and allows the individuals in the team to be closer than ever. Technology, such as e-mail, chat room, and telepresence or video conference, helps the transfer of tacit knowledge among the team members. Technology allows the team to get closer and enhances the

relationship through open communication. The transfer occurs anytime and anyplace. Company D uses technology extensively to allow the sharing and learning, even without having physical office space for the team to meet.

The second crucial component of this meta-routine element is the agility to react to the transformation of new knowledge. The efficiency of knowledge transfer comes from the flexibility of the designated team responsible for the transfer needs. Flexibility comes with empowerment from top management for the team to adjust resources to support the transfer. For example, cases with high flexibility allow team leaders to select the team members during the formation of the teams before the transfer, while the rigid teams have to deal with the assigned team members from the business lines.

Managing internal selection regimes. For IT SMEs, the internal selection process is carried out by top executives. This process for some cases is done since the early phase of knowledge absorption. But for some cases that have complex organization, the selection can be done at a later phase when more details spring up in the absorption process. The critical decision is made by answering the question of whether the existing knowledge traits fit with the new knowledge structure to be absorbed. For some cases, the new knowledge means an extra resource to allocate when it has been applied to the customers. If the trait is so much different, the supporting team may have difficulty providing quality support to the customers.

There are some other critical questions that were raised during the data collection. Time to deploy new knowledge to the market is one factor. If the time required to absorb and exploit the new knowledge is too long, the absorption may be discarded. Another critical question deals with the means to penetrate the market. If the market is

already saturated, occupied, or too much effort is required to penetrate it, the absorption may also be discarded.

Sharing knowledge and superior practices across the organization. Apart from inter-disciplinary knowledge transfer routines, assistive technology—such as document management system, record archival system, or simple file sharing and archival system—helps with the transfer of explicit knowledge. Every case in this study places emphasis on using these systems to retain the documents and logging into the reports to record the details of transactions and activities when dealing with suppliers and customers. These systems serve as the explicit knowledge repository for new members to learn about a certain project or to review the past history each company previously encountered.

There is much evidence from these cases mentioning the time and effort consumption required in the externalization of this explicit knowledge. Some companies with complex organization structures decided to add extra manpower to ensure archiving of the reports is carried out.

Reflecting, updating, and replicating. At this meta-routine stage, the critical process that every company needs is the Knowledge Management practice. For all cases, there are evidences that the companies require disseminating the knowledge and the results of applying knowledge to the customers. There are venues for the knowledge sharing to happen to which all team representatives must attend. The shared knowledge is documented in an archival system, and this is valid throughout all cases. Feedback flows freely in the session. The expected outcome is the organizational knowledge that must be retained and updated over time.

Managing adaptive tension. A measurement index is key to benchmark the performance and the competitive advantage gained from applying new knowledge. Each company has their own workforce and procedures to perform the data collection and analysis to derive results.

The first measurement index is the competitor analysis. The input feedback is mostly from the sales teams on the activities of competitors. In any of the projects, whether the sales is successful or not, the sales teams will conduct the competitor analysis highlighting differences in strategies, pricing and promotion, as well as the offering of technological solutions. The information about the competitors is provided by the customers. The degree of reliability is dependent on the social relationship between the sales team and the customers.

The second measuring index is customer satisfaction. At the end of sales activities, the designated sales person will conduct a survey call to the customers, seeking feedback.

The third and the most critical index involving the application of new knowledge is customer retention. Indicators like repetitive purchasing, customer loyalty or enquiry call from customer are included in the indexes to reflect competitiveness of the company.

In the preferred index, resellers who are enlisted as a preferred vendor are perceived as value added services. This is because the indicator signifies quality and trusting services by the customers.

From the research analysis, it is obvious that all companies focus on customer retention. In term of competitor analysis, company A, B, C, and T conducted this

assessment, with company A and T in particularly measuring customer satisfaction levels.

Knowledge spillover is another concern of the dissemination of knowledge to customers and to the market. This is particularly so for IT SMEs who are distributors. They are tasked to educate the market on new trends and the functionality of their products. This spillover is persistent among competitors who are constantly learning and competing. To overcome this fear, these IT SME distributors adopt the role in educating the market and become trendsetters. The benefit of a knowledge enriched market has more potential than the fear of losing the competitive advantage.

In summary, each company may use a different set of measuring indexes. These indexes reflect the quality of a company when applying new absorbed knowledge. The common indexes that reflect the quality of knowledge in order to enhance competitive advantage are listed in Table 4.19.

Table 4.19: Measuring indexes as emerged from the case studies

No.	Measuring Index	Description
1	Customer retention	Ability to retain customer counts as the strongest customer trust index. It shows the ability to perform to the customer's expectation and shows the ability to compete with rival competitors.
2	Customer satisfaction	A survey for the level of customer satisfaction with the knowledge and service quality. The survey is done once a year and may possess some bias when conducting the survey.
3	Enlisted in supplier trustworthy list	Important for the value-added reseller as customer may obtain the list of favorable companies who can deliver quality of knowledge and services.
4	Customer preference	Indication of being a customer preference when need for repetitive purchase, and number of calls from customer when thinking of new solution looking for a new solution or information

4.3.3 Summary of Sub-Research Question 2 (RQb): What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?

Summarizing of each factor emerges from the case studies in the exploratory regimes from the Table 4.3; the result is shown in Table 4.20.

Table 4.20: Cross-case consolidation of factors which have impact on the successful or unsuccessful absorption of new knowledge in IT SMEs

Agent Role	**Behavioral Factor**	**Impact Factor**	**Process and Routines Factor**

• Decision Maker
• Gatekeeper, Translator, Interpreter
  ○ Language barrier
  ○ Context conversion
  ○ Metaphor and analogy
  ○ Knowledge codification
• Informant
	• Trust relationship
	  ○ Trust from customer
	  ○ Trust from management
	  ○ Recognition of being a part of a successful team
	• Building of trust relationship
	  ○ No blaming culture
	  ○ Recognition
	  ○ Shared vision
	  ○ Leadership
	• Learning mindset
	  ○ Service mind attitude
	  ○ Continuous learning
	  ○ Passion to learn
	  ○ Self-preparation for knowledge transfer habit
	  ○ Motivation of thriving to be in business
	  ○ Thriving for new knowledge is a challenge
	• Monetary motivation
	• Knowledge hoarding
	• Psychological safety
	  ○ Fear of speaking or asking question in public
	  ○ Language barrier
	  ○ Size of knowledge transfer group matters
	• KPI as demotivator
	  ○ Stress
	  ○ Turnover
		• Triggering points
		  ○ Customer demand
		  ○ Supplier influence to learning
		  ○ Outsourcing strategy
		• Efficacy of knowledge dissemination
		  ○ Empowerment
		  ○ Social relationship
		  ○ Knowledge traits fit
		• Knowledge transfer mean and method
		  ○ Repetitive assignment
		  ○ Capability matching to task assignment
		• Space for knowledge transfer
		  ○ Assistive technology
		  ○ Collaborative environment
		  ○ Open space workplace
		• Quality of knowledge transfer
		  ○ Segregation of knowledge recipients
		  ○ Use of prototype
		  ○ Feedback
		• Measuring indexes
		  ○ Time spent on project: insufficient knowledge
		  ○ Customer retention
		  ○ Customer benefit as criteria for selection (Reduce cost, increase satisfaction, increase productivity): so called Appropriability
		  ○ Time to educate market
		• Knowledge spillover
			• Quality assurance process
			  ○ Simulation process
			• Feedback routines
			  ○ Lessons learn session
			  ○ Performance evaluation
			• Measurement of success
			  ○ Customer retention
			• Knowledge screening routine

Table 4.21: Exploratory regimes and weighing scale of occurrences

Exploratory regimes	Consolidated factors (2nd order coding)	1st order coding	Occurrences of factors on company and scale											
			A		B		C		D		M		T	
Agent roles	Gatekeeper / Translator / Interpreter	• Language barrier	X	4		3		3		1		2	X	4
		• Context conversion	X								X		X	
		• Metaphor and analogy												
		• Knowledge codification			X									
		• Use of common language			X									
		• Metaphor and analogy					X							
		• Translating					X				X		X	
	Decision Maker	• Sole decision maker	X		X				X				X	
		• Panel of decision makers					X							
	Informant	• Trade negotiation and market trend update	X											
Behavioral factors	Trust relationship	• Trust from customers		6		5		1	X	2		2		4
	Building of trust relationship	• No blaming culture	X											
		• Recognition	X											
		• Shared vision	X											
		• Leadership	X											
		• KPI as demotivator	X											
		• Thriving to be in business					X							
		• Monetary Reward	X										X	
		• No trust and respect									X			
		• Recognition from being in a successful team											X	

(Continued)

Table 4.21 (Continued): Exploratory regimes and weighing scale of occurrences

Exploratory regimes	Consolidated factors (2nd order coding)	1st order coding	Occurrences of factors on company and scale											
			A		B		C		D		M		T	
	Knowledge hoarding	• Incomplete and legality											X	
	Psychological safety	• Fear of speaking or asking question in public							X		X		X	
		• Size of knowledge transfer group			X									
	Learning mindset	• Service mind attitude			X									
		• Continuous learning			X									
		• Habit for self-preparation for knowledge transfer			X									
		• Passion of learning			X				X				X	
Impact factors	Triggering point	• Customer demand	X				X							
		• Supplier influence to learning									X			
		• Outsourcing strategy												
	Efficacy of knowledge dissemination	• Empowerment	X	7		6	X	6		6		7		6
		• Social relationship	X		X				X		X			
		• Knowledge traits fit	X				X				X			
	Knowledge transfer mean and method	• Repetitive assignment									X			
		• Capability matching to task assignment									X			

(Continued)

Table 4.21 (Continued): Exploratory regimes and weighing scale of occurrences

Exploratory regimes	Consolidated factors (2nd order coding)	1st order coding	Occurrences of factors on company and scale											
			A		B		C		D		M		T	
	Space for knowledge transfer	• Assistive technology					X		X					
		• Collaborative work environment							X					
		• Open space workplace									X			
	Quality of knowledge transfer	• Segregation of knowledge recipients	X											
		• Knowing knowledge recipients			X									
		• Use of prototype	X		X		X		X		X		X	
		• Feedback and team communication			X				X				X	
		• Knowledge stickiness (not being transferred)											X	
		• Shared vision											X	
	Measuring indices	• Time spent on project (indicates insufficiency of knowledge)											X	
		• Customer retention					X		X					
		• Customer benefit (reduce cost, increase satisfaction, increase productivity)											X	
		• Time to educate			X									
	Knowledge spillover	• Educating market	X		X									

(Continued)

Table 4.21 (Continued): Exploratory regimes and weighing scale of occurrences

Exploratory regimes	Consolidated factors (2nd order coding)	1st order coding	Occurrences of factors on company and scale											
			A		B		C		D		M		T	
Process and routines	Quality assurance process	• Simulation process		0	X	1		3		0		2		2
	Feedback routines	• Lesson learned session					X				X		X	
		• Performance evaluation					X							
		• Check and balance routines (verification process with others in the industry)											X	
	Measurement of success	• Customer retention					X							
	Knowledge screening routines	•									X			
		Total counted scale		17		15		13		9		13		17

Table 4.22 combines the weighted occurrences of exploratory regimes with the regimes explored from the literature review as demonstrated in Table 2.25.

Table 4.22: The number of occurrences of the exploratory regimes with literature review

Exploratory Regimes	**A**	**B**	**C**	**D**	**M**	**T**	**Avg.**	**Lit. Rev.**
Agent roles	4	3	3	1	2	4	2.50	17
Behavioral Factors	6	5	1	2	2	5	2.33	11
Impact Factors	7	6	6	6	7	6	3.00	39
Process & routines	0	1	3	0	2	2	1.33	18
Total	17	15	13	9	13	17	9.17	85

Figure 4.11 shows the distribution of the exploratory regimes. When the distribution is plotted against the details derived from the literature review, it is found that not all companies have evidence of having process and routines in place when dealing with absorptive capacity.

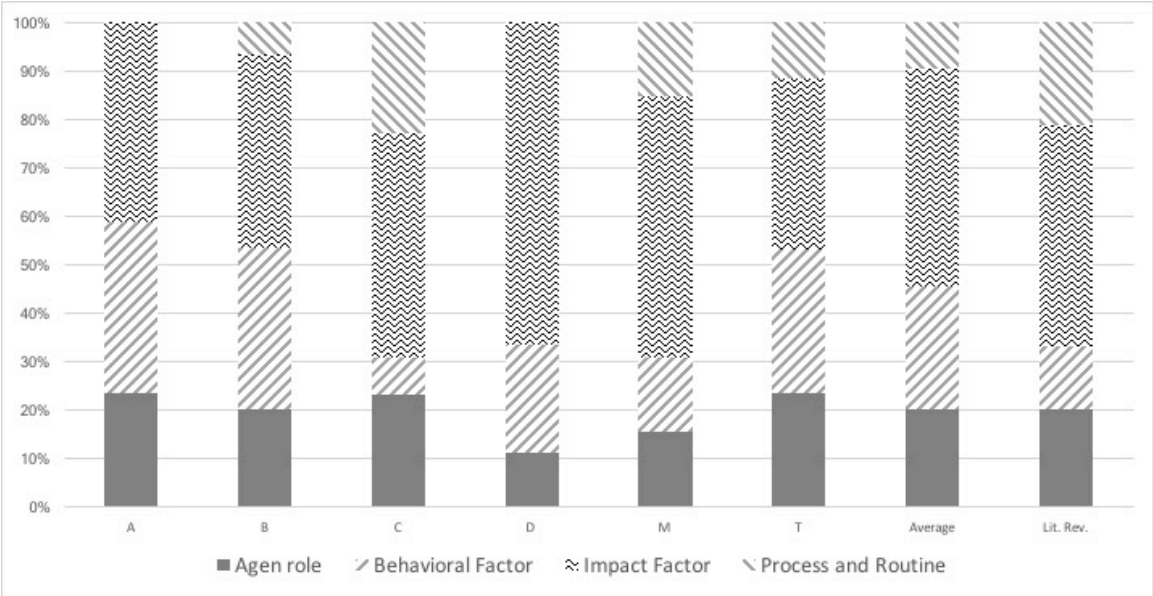


Figure 4.11: Combine weight occurrences of exploratory regimes with literature review

Every company has been using the special agent function to help the knowledge get disseminated across the organization. Many of them have emphasis on building cultures and developing motivational factors to induce new knowledge absorption. There are many varying relevant factors that each company confirms to influence knowledge absorption.

Agent Role. In this regime, the roles and responsibilities of the individuals are examined. The first role is the decision maker. In IT SMEs, decision making is solely dependent on top executives. In all six cases, they also are the founders of those companies. Decision-making spans from the identification of new knowledge, the arrangement of organizational structure to new knowledge absorption, the internal selection, and the determination to allocate all resources to undertake the transformation of the new knowledge. In some cases, empowerment is delegated to the knowledge absorption team leader, thus allowing the team leader flexibility in

making decisions during absorption. Empowerment has a positive impact on the efficiency and efficacy of the absorption process.

Other roles are those of gatekeepers, translators, and interpreters. These roles come into play when there is knowledge transfer across a company boundary or an interdisciplinary team boundary. The more the crossing of the boundary the more the involvement of these actors. This is the reason why the transfer efficacy is higher in a less complex company. These companies involve fewer intermediary persons, resulting in higher efficiency of the transfer and less ambiguity of the transfer context. For IT SMEs, the gatekeeper will take on ownership of the new knowledge and will ensure that the knowledge transfer happens to the person involved. Translating and interpreting happen when the transfer involves multi-lingual communication. English is the common mean of transfer when it is done by an overseas supplier. Most IT SMEs employees do not communicate properly in English.

Three dominant functions of the gatekeeper across cases refer to their ability to overcoming language barriers, and the context of language conversion and translation. For Thai employees, speaking in public or using other languages is an obstacle. The gatekeeper is expected to be the vocal representative when asking questions to the foreign suppliers and translating the context to confirm common understanding in knowledge transfer sessions.

Behavioral Factor. This regime explores the behavioral elements that influence the successful or unsuccessful absorption of new knowledge. The behavioral factors that emerge from the data collection are comprised of the positive, neutral, and negative reinforcement toward the successful and unsuccessful measures. The positive reinforcement has an influence on enlarging the absorptive capacity. The neutral

shows inconclusive influence if the positive or negative is to yield, the result of applying the reinforcement can be either way. The negative reinforcement will have a negative influence on the new knowledge absorption.

The most outstanding positive behavioral reinforcements that emerged from the case studies are the ‘learning mindset’, ‘trust’, and ‘building of trust’. Learning mindset is fundamental to the company culture of the six companies examined. Learning mindset has a direct impact on absorptive capacity. From the cases, the learning mindset is developed through the act of top executives as the role model, encouraging other subordinates to follow.

The attitudes toward the learning mindset that emerge from the cases are the service mind attitude, the continuous learning attitude, the passion to learning attitude, the self-initiated to learning attitude, the thriving to be in business attitude, and the learning as a challenge attitude. The service mind attitude will equip each individual to empathize with others that need help, as if he/she is facing the difficulty himself/herself. This attitude will encourage an individual to look for ways to solve the problem. The continuous learning mindset will encourage an individual to keep looking for ways of improvement. The passion to learning mind will give an individual the craving to look for new knowledge. The self-initiated to learning mind creates the discipline of learning and allows the learning to happen anywhere, anytime, and under any circumstances. The thriving to be in business mindset will guide each individual to realize that the business will be in trouble if he is not trying to learn new things. Seeing learning as a challenge will give an individual a boost to overcome difficulty in obtaining knowledge.

The second positive reinforcement is trust. Trust is the socio-psychological behavior (Sun & Anderson, 2010) that is essential to facilitate the efficiency of the transfer. Trust from the customer allows ease of knowledge flow and absorption to the customer, while the trust from supplier encourages the amount of support in order to facilitate the knowledge transfer to internal or external recipients. Trust from management gains empowerment, which results in flexibility in the knowledge transformation process. Trust from peers also gains recognition and enhances the efficacy of knowledge exploitation process.

The third positive reinforcement is the socio-psychological process of building the trust itself (Roxas, 2008). From the case studies, trust can be built through the mentoring and coaching program. The objective of the program is to develop a 'No blaming culture', which will allow the sharing of knowledge to happen without any fear of this being taken as a wrong decision or an act of stupidity. The process to build this trusting culture is through the shared vision of where the new knowledge will bring the company and the benefits the company and individual will realize. The establishment of recognition among peers in a peer culture helps the individual feel that they are an important member of the delivering team. The leader of the team must also lead and act to ensure the team members are on board to deliver something important.

The neutral reinforcement is the use of monetary reward to motivate the team to absorb knowledge. From the evidence collected, some of the case companies use monetary rewards for team performance. However, this kind of reward cannot compensate the underachiever of the team when they miss that target. Monetary rewards cannot be seen as a positive reinforcement. On the contrary, sometimes it acts

as a demotivator by itself when other useful resources necessary for absorption are not properly allocated.

Negative reinforcement has a reverse impact on the efficacy of knowledge absorption. There are three factors in this negative category: knowledge hoarding, psychological safety, and KPI. Knowledge hoarding exists in two of the companies (Company A and Company T). The hoarding of knowledge results in not fully transferring knowledge from one team to another. When this happens, the company will have trouble in coordinating the work, and will end up by having the knowledge originating team held responsible for customer support throughout the entire project phases. The company also possesses the risk of losing knowledge when some employees leave the company that is losing this organizational knowledge with them.

The second negative reinforcement is the fear of psychological safety. It becomes quite common for the Thai members of these companies not to speak out, not to ask questions, and not to provide comments or give feedback in the class-room knowledge transfer. This comes from the non-fluency in using other language as a means to communicate during the transfer session. It is clearly seen that language is the barrier to expressing feedback. The size of the transfer group also has an impact on the fear of expressing feedback. The Thai in IT SMEs also has a fear of asking question or providing comments when the transfer group is large. From the collected evidence, it can be seen that if the transfer is happening in a small group, especially with the same knowledge discipline, providing feedback occurs freely.

Table 4.23: Summary behavioral factors

Behavioral Factor	Type of reinforcement			Description
	Positive	Neutral	Negative	
Learning mindset	x			Companies in the case studies address the learning mindset as the core value. The top executives act as the role model in developing the willingness to learn attitude and enforce it in the company to create the atmosphere of learning.
Trust	x			Trust relationship is seen as very important for all companies in the case studies. All of them spend resources in building trust, either with customers or suppliers, and among partners and colleagues as well.
Building of trust	x			Some companies in the case studies spend time and effort in building trust through coaching and mentoring program. The intention is to create the sharing of knowledge culture with no blaming of failure.
Monetary motivation		x		Monetary incentive is used to motivate the absorption of new knowledge, but does not appear as positive reinforcement, nor yield the negative effect.
Knowledge hoarding			x	Holding knowledge and not sharing still exists in some of the cases, resulting in inefficient knowledge transfer across knowledge disciplinary boundary.
Psychological safety			x	For IT SMEs, fear of asking questions in public, fear of speaking in English negatively affect the quality of knowledge transfer.
KPI			x	KPI is seen as negative motivator as it always leads to stress and turnover. Most of the companies do not use KPI to track performance.

Impact Factor. Triggering points initiate the entire absorption process to which it contributes the efficacy of knowledge assimilation, the knowledge transfer mean and method, the space for the transfer of knowledge, the quality of knowledge transfer, the measuring of indexes, and the knowledge spillover.

The initial factors that activate the entire process of knowledge absorption are the triggering points to decide whether the new knowledge is of interest and should be considered for absorption. Variables such as customer requirements, technology

change, supplier enforcement, law-abiding requirements, or best-practice standard compliance can trigger the decision to absorb.

The second factor is the efficacy of assimilation. The factors in this category determine the variable that influences the efficacy of the knowledge transfer mechanism. Factors like empowerment and flexibility, the socio-psychological process, and the knowledge traits fit, are the variables that contribute to the efficacy of knowledge assimilation.

The third factor is the mean and method of the transfer. The techniques in this category impact the efficiency of the transfer. Techniques such as repetitive assignment to ensure the transfer is performed until learnt; or capability matching to ensure that each employee can leverage his relevant ability to perform the job and help in the knowledge transfer process.

The fourth factor is the transfer and transformation space. In this category, both the physical and virtual constitute the foundation infrastructure of the transfer. Arrangements to have a venue for knowledge exchange, or the organizing of open space workspace to allow the instant free flow of knowledge, encourage the share and transfer. Using assistive technology, such as video conferencing or the use of chat applications, allows the need for physical space meeting with high agility in knowledge transfer to occur.

The fifth factor is the quality of the transfer. The variables in this category influence the knowledge transfer quality. The technique, like segregating the recipient, arranges a group of similar knowledge levels so the transfer context can be delivered to match the audience. A similar technique, such as arranging in a small

group, results in higher efficiency in two-way communication for better feedback and response.

The sixth factor is the measurement indexes. It is quite crucial to measure the results of knowledge exploitation and the impact on customers since it determines competitive advantage.

The last concerning factor is knowledge spillover. This factor has high impact and concern as a risk for the distribution sector of IT SMEs. The key activity of the distributor is to educate the market. Sometimes state-of-the-art knowledge has to be disseminated. A public announcement means the spread messages and knowledge to everyone in the market, including the competitor. However, this risk has to be balanced. Without transferring, there would be no spillover, but the market will not be educated, and the absorbed knowledge will not leverage the company's value. Conversely, too much of the transfer will disclose secret proprietary information that the competitor can follow and benefit from.

Process and Routine Factor. The knowledge screening routines, the feedback routines, quality assurance process, and the measurement of success are the combination of processes and routines that influence absorptive capacity. The first process to perform is the knowledge screening routine, which takes place prior to new knowledge adoption. The selection comes from the matching of existing knowledge traits with the new set of knowledge to see if the new can fit with the existing. Once the decision on absorption is made, the following processes and routines can occur. The matching involves the assessment and examination of the efforts that will be involved when absorbing the new knowledge.

Knowledge screening routine. For the knowledge screening routine, which is the essential step in the internal selection regime of the absorptive capacity meta-routines, a cross examination between the fitness of the existing knowledge and the new knowledge—in combination with the impact the new knowledge has on competitive advantage—constitutes the decision. A simple matrix as appears in figure 4.12 can help in making the knowledge screening decision.

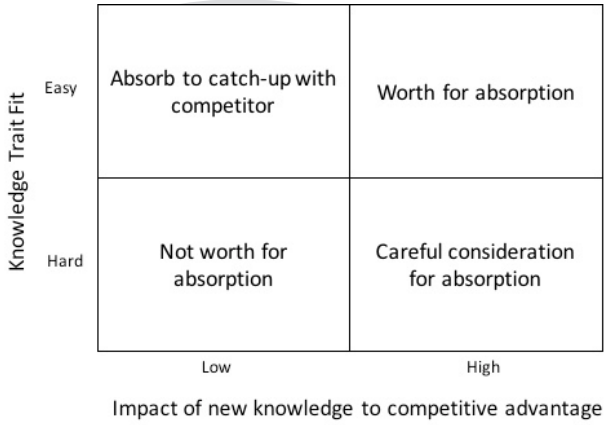


Figure 4.12: Knowledge screening matrix to help ease the decision making on Internal Selection Regimes

The upper-right corner of the matrix indicates the knowledge considered for absorption which has a high impact on competitive advantage, with ease of absorption through the fit of the knowledge traits. The consideration for absorption that falls within this quarter of the matrix will eventually be absorbed to gain the highest benefit. The knowledge that falls into the bottom-right corner will be the knowledge that gives high impact on competitive advantage while efforts to absorb may be high. The decision of whether the effort is worth investing in must be made carefully. For example, knowledge that requires recruitment of additional man-power may fit within this category. However, hiring new employee involves other costs as well, such as

office space, fringe benefits, and other long-term personnel development programs. The knowledge to absorb in the upper-left quadrant has lower value to competitive advantage, but can be done with ease. An example of this is to offer services that competitors already have. What the company would do is offer the same services to complete the line of selection. Any knowledge that falls into the lower-left quadrant is not worth the consideration. It will not give competitive advantage, nor is it worth the extra efforts required for implementation.

Feedback routines. The most important process is the feedback routines. As discovered from the case studies, feedback routines are essential and apply to every step in the meta-routines of absorptive capacity. From Lewin's et al. (2011) work, feedback occurs at the very end of the entire process. However, from the analysis of the case studies, it is found that some forms of feedback occur along the meta-routine. This feedback is in the form of the simple project status update, the lesson learned session, or the project close-out performance evaluation. The companies in the case studies have the meeting venue to reflect on the results of every action taking place in the absorption process, as well as the reflection perspective from suppliers, partners, and customers. This feedback allows the company to react to changing requirements in a dynamic environment.

Quality assurance process. The quality assurance process is the process of ensuring that the absorbed knowledge will deliver a quality value to the customers. All companies in the case studies engage this process before delivering new products or services to ensure they will perform as they are supposed to. It is crucial for the company to learn all functionality and features of the products and services they are offering. In-depth tacit and explicit knowledge must be gained through the quality

assurance process. The key activity is to simulate the operational process through the lab setting and the use of product prototyping. The simulation involves the setting up of the system with simulated data to see how the system functions, how the system handles the exceptional conditions, and how the system delivers a real experience to a customer. This process requires extensive support from the suppliers and partners in delivering the simulated environment, and collaboration from customers in walking through the adoption environment. The delivered outcome of the process is the vision of how the new product or service will perform, with the level of expectations and the exceptions.

4.3.4 Financial Performance as a Performance Indicator of Absorptive Capacity

Weighting is applied in order to quantify the level of absorptive capacity under the perspective of meta-routines and exploratory regimes. Three financial performance indicators are collected from Thailand's Department of Business Development website. It is the duty of Thai listed companies to report the financial statements and analysis of financial performance to this government agency. The three financial performances that relate to the performance of absorptive capacity are the Total Asset Turnover, Total Account Receivable Turnover, and the Gross profit margin. Table 4.24 displays the data relating to absorptive capacity meta-routines, the exploratory regimes, and the 3-year average of the three financial performances. The values are normalized into per percentage per respondent basis to eliminate the differences of organization complexity as appear in Table 4.25. This allows the values to be compared across all case studies on a common ground basis. Note that the percentage per respondent is used rather than employee because the unit of analysis in this research study is at the firm level. The employee value will result in dispute

discussion. The percentage per respondents is used instead to eliminate the complexity of the organization size. Data are normalized by dividing the percentage of respondents from the total number of employees in each company. This allows the fair comparison and defines the relationship with the financial performance indexes.

Table 4.24: Value of AC meta-routines and exploratory regimes vs. financial performance

Company	Number of Emp.	Number of interviewee respondent	Percentage of respondent to employee (%)	Total AC meta-routines	Total Exploratory Regimes	Avg. Total Asset turnover (TA Turnover: times)	Avg. Total Account Receivable turnover (AR Turnover: times)	Avg. Gross Profit Margin (GPM: %)
A	35	5	14	18	17	1.66	8.05	25.79
B	30	5	17	15	15	0.94	3.39	26.45
C	36	4	11	14	13	1.88	6.26	20.53
D	5	5	100	14	9	2.28	4.90	10.77
M	28	5	18	16	13	2.16	9.80	41.92
T	34	10	29	15	17	0.66	4.49	28.77

Table 4.25: Calculated indexes with normalized value per percentage of respondent

Company	AC Meta-routines per percentage of respondent	Expl. Regimes per percentage of respondent	TA Turnover per percentage of respondent	AR turnover per percentage of respondent	GPM per percentage of respondent
A	2.57	2.43	0.24	1.15	3.68
B	2.50	2.50	0.16	0.56	4.41
C	1.22	1.44	0.21	0.70	2.28
D	14.00	9.00	2.28	4.90	10.77
M	2.50	2.32	0.39	1.75	7.49
T	4.71	5.00	0.19	1.32	8.46

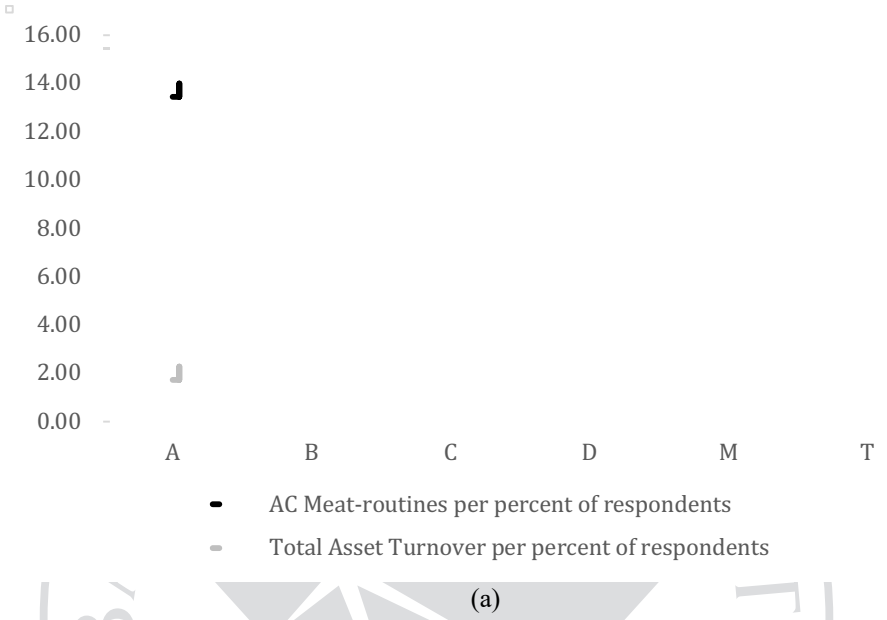
When comparing the absorptive capacity meta-routines or the exploratory regimes with the three financial performance indices, we need to compare the per percentage of respondent values. The use of per percentage of respondent value allows the comparison on the same baseline.

Total asset turnover is the ability of a firm to turn the asset into revenue. In the resource base view, this indicator will determine the firm's efficiency in converting these resources into business profit. From Figure 4.13a, the meta-routines and total asset turnover is moving in the same direction. This means that the larger the effort put into constructing absorptive capacity meta-routines, the higher the efficiency in turning resources into revenue.

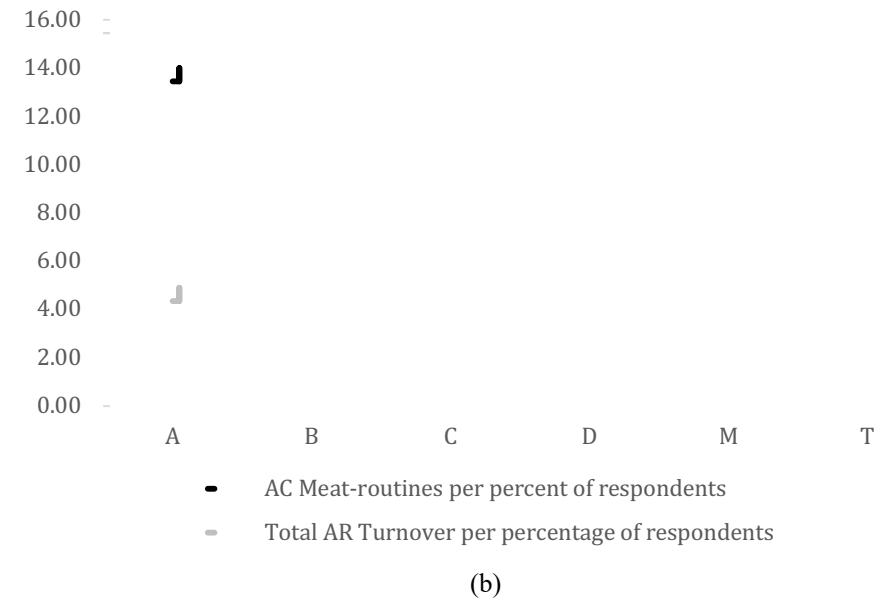
Account Receivable turnover is the firm's ability to convert the outstanding account receivable into collectible cash. AR turnover has a direct impact on the company's cash flow. The higher the AR turnover, the better the business financial liquidity. Figure 4.13b shows the trend of relationship direction of absorptive capacity meta-routines and the account receivable turnover. The higher effort put into the construction of absorptive capacity has a positive impact on the account receivable turnover. Absorptive capacity helps improve the ability of the firm to collect outstanding cash, hence improve cash flow of the company.

Gross profit margin is the firm's percentage in profit margin over the cost. The larger the profit, the better the firm operations. Larger in profit margin also reflects the degree of preference the customer has for the firm over other competitors. As shown in Figure 4.13c, the meta-routines and gross profit margins tend to move in the same direction. Thus, the two variables are positively related. The more effort put into constructing a firm's absorptive capacity in the view of meta-routines, the wider the

gross profit margin. Especially in IT SMEs where products are not much different among competitors, the preference occurs from the differentiating of knowledge via the development of absorptive capacity.



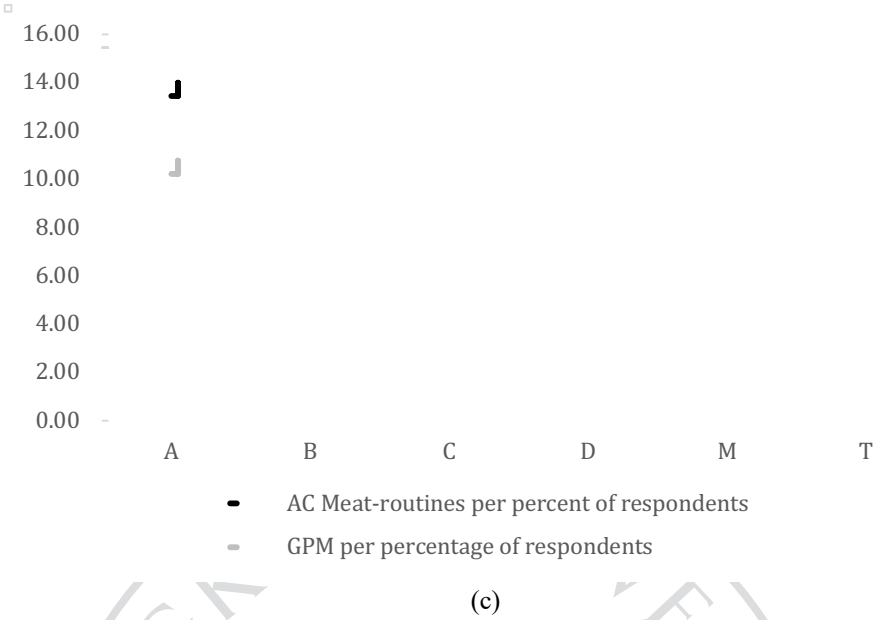
(a)



(b)

(Continued)

Figure 4.13: AC meta-routines vs. financial performance indices (a) total asset turnover, (b) total AR turnover, and (c) total GPM



(c)

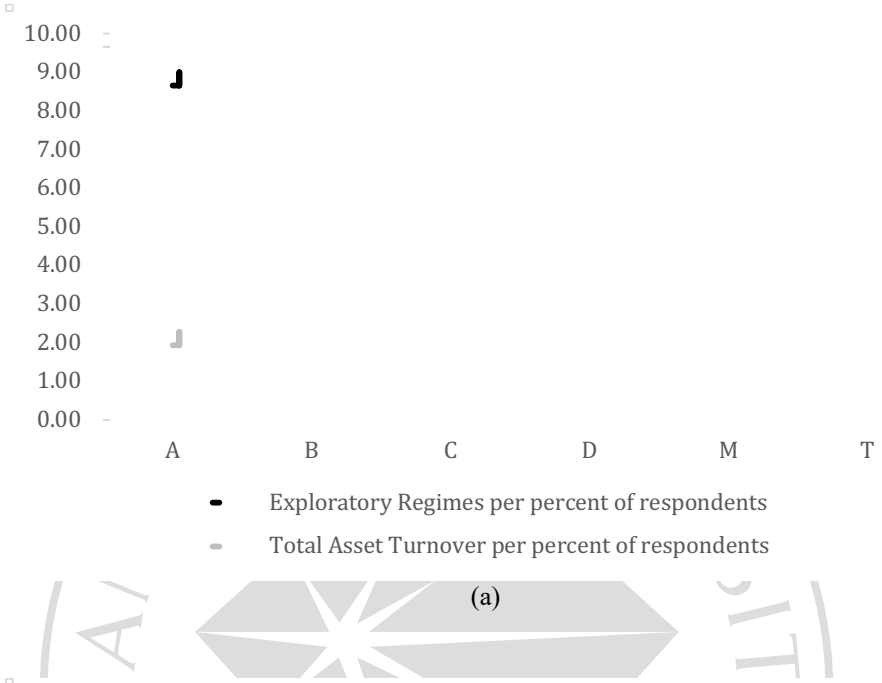
Figure 4.13 (Continued): AC meta-routines vs. financial performance indices (a) total asset turnover, (b) total AR turnover, and (c) total GPM

Figure 4.14 explores the factors pertaining to the exploratory regimes and the financial performance. Figure 4.14a shows the relationship between exploratory regimes and the total asset turnover. The relationship between the two has a positive effect. This means that the more effort the company is putting into using factors in the exploratory regimes when constructing absorptive capacity, the higher the value of the asset turnover.

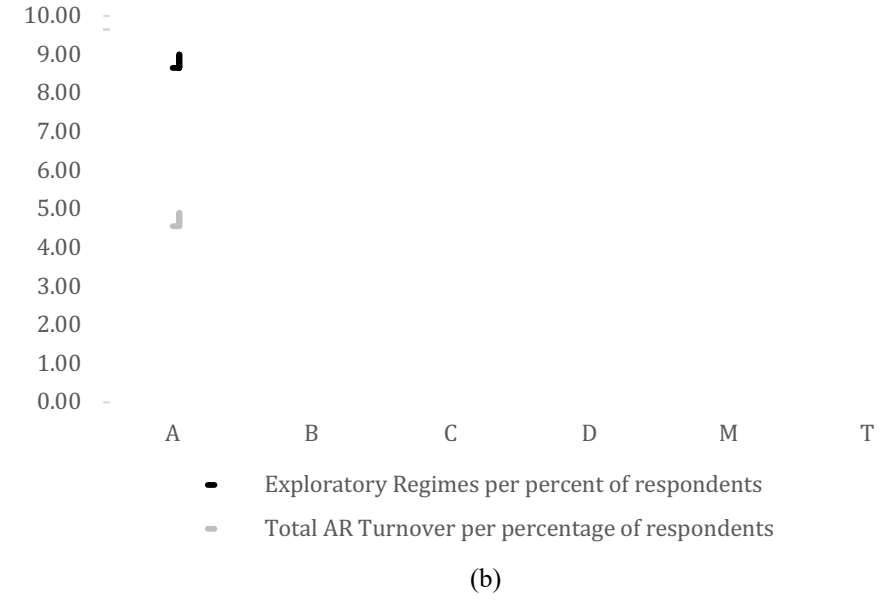
Figure 4.14b shows the trending relationship between exploratory regimes and account receivable turnover. The development of absorptive capacity by using exploratory regimes variables helps increase the account receivable turnover, thus improving the company cash flow.

Figure 14.4c shows clearly that the relationship between the exploratory regimes and the gross profit margin is positive. The more effort put into the development of

absorptive capacity under the perspective of variable factors of exploratory regimes, the higher the gross profit margin.



(a)



(b)

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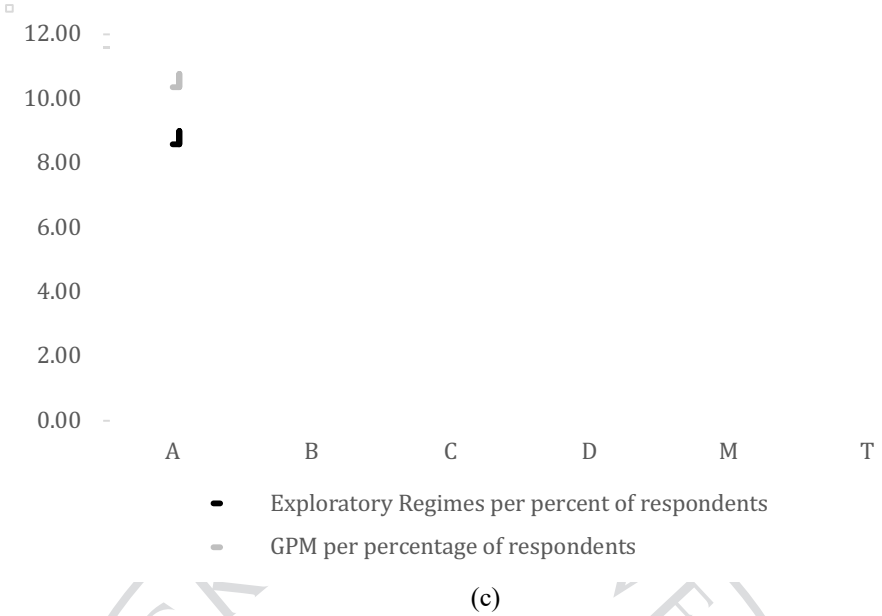
Figure 4.14: Exploratory regimes vs. financial performance indices (a) total asset turnover, (b) total AR turnover, and (c) total GPM



(c)

Figure 4.14 (Continued): Exploratory regimes vs. financial performance indices (a) total asset turnover, (b) total AR turnover, and (c) total GPM

In Table 4.26, the Pearson's R algorithm is used to calculate the relationship between variables. The magnitude of the value in each instance indicates the degree of significant of relevancy. The higher the relevancy, the closer the value comes to 1. If the value is closer to 0, the two variables are not related. When the number is positive, the two variables align in the same direction. The sign of positive or negative indicates the direction of relevancy. When the sign is negative, the two variables are in an inverse relationship. For the relationship between absorptive capacity meta-routines or the exploratory regimes and the three financial performance indices, the relationship is in the same direction, showing that they highly relate to one another.

Table 4.26: Pearson's R relationship between absorptive capacity meta-routines or exploratory regimes and the three financial performance indices

	TA turnover per percentage of respondents	**AR Turnover per percentage of respondents**	**GPM per percentage of respondents**
AC meta-routines per percentage of respondents	+0.96	+0.96	+0.81
Exploratory regimes per percentage of respondents	+0.89	+0.91	+0.87

4.4 Chapter Summary

In this chapter, collected data were analyzed and synthesized in an attempt to provide answers to the primary and subsidiary research questions. The case studies are reported in section 2 of this chapter, and in section 3 the common characteristics are synthesized to describe common patterns and themes.

To answer the primary research question i.e., "How do IT SMEs absorb new knowledge?" this study focused on the factors that pertained to decision-making and the factors that impacted the transfer of new knowledge across the organization.

The factors influencing the decision to absorb new knowledge were the type of IT SME, the meaning and purpose of the firm existence, the firm strategy on its product or services, and the triggering factors to knowledge absorption. These factors had a positive impact on the time to absorption of new knowledge. When combining time to absorption between different types of strategies, a matrix of likelihood to decision-making was developed (see Figure 4.7).

Exploring the factors that concerned knowledge transfer across the organization, it was found that the organizational structure has direct impact on the efficacy of the

knowledge transfer, and the extent of the knowledge transfer crossing boundaries had impact on the efficiency of the process.

To answer the Sub-Research Question 1 (RQa) i.e., “How do Absorptive Capacity Meta-routines explain the absorption of new knowledge in IT SMEs?” all the eight absorptive capacity meta-routine elements were explored. Findings revealed that all Lewin et al.'s (2011) absorptive capacity meta-routines existed through the absorption process. However, there were two missing elements of meta-routine for IT SMEs. The first was the feedback loop. Lewin’s meta-routines indicated that the feedback loop occurred at the stage of reflecting, updating and replicating routines. In this study it was found that feedback was a very crucial and necessary process that occurred at every stage of absorption. The second finding regarded the fact that IT SMEs were small and most of the decision making processes were done by the top executives. The absorption of new knowledge was carried out early in the process. It was very hard to separate between the *identification and recognition of the value of internally generated knowledge* and the *internal selection regime*. The two overlapped. Once the value of new knowledge was realized and the decision to absorb was made, it then included the internal selection regime.

To answer the Sub-Research Question 2 (RQb) i.e., “What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?”, the four exploratory regimes that were drawn from the literature review were examined. Details were collected per each regime. Findings revealed that decision making contributed conspicuously to initiate the process of absorption and to ensure the subsequent knowledge transformation into the organization. The role of gatekeeper/translator/interpreter existed when knowledge spanned across the borders.

In some instance, the informant role was also necessary e.g., when dealing with Chinese suppliers where in-depth communication was required.

Positive and negative reinforcements were also explored. Positive reinforcements referred to learning mindset, trust, building trust that had an impact on knowledge absorption. The neutral reinforcement regarded the monetary rewards. The negative reinforcement referred to knowledge hoarding, psychological safety, and enforcement of KPI.

Each element of absorptive capacity meta-routines was explored at a deeper level of details. The internal processes and routines associated with each element of meta-routines was identified, compare, and analyzed. Findings revealed that those routines that had high impact on new knowledge absorption were knowledge screening, feedback, quality assurance, and the measurement routines. Knowledge screening routine was reviewed and synthesized. The decision matrix on internal selection was formulated.

It was also found that the feedback routines involved knowledge transformation and exploitation, lessons learned, and knowledge implementation. Feedback routines were found to be embedded throughout the entire process of knowledge absorption.

Quality assurance was found to influence the quality and integrity of delivered products and services. All cases ensured correct knowledge absorption through learning using prototyping. In-depth tacit knowledge was transferred before delivering the results to customers.

Lastly, the measurement of results was synthesized and included customers' retention, competitor analysis and supplier preferences analysis that were found in some of the analyzed organizations. Analysis of performance revealed a link between

absorptive capacity and financial performance with valuable information about turnover and firm's gross profit margins.

CHAPTER 5

DISCUSSION AND CONCLUSION

5.1 Introduction

In this chapter I summarize the answers to the main research question (section 5.2) and the two sub questions (section 5.2. and 5.3) and discuss these in relation to my review of the existing research in chapter 2. The contribution to existing research is summarized in section 5.4 and the limitations of the research in section 5.5. Finally, suggestions for future research are made in section 5.6, the business and managerial implication in section 5.7, and the chapter is concluded in section 5.8.

5.2 Discussion and conclusions on Primary Research Question

Two factors emerged from the analysis that was carried out to answer the primary research question: "How IT SMEs absorb new knowledge?". These two factors were: 'Recognizing the value of external knowledge' and 'Efficacy of the knowledge transfer and transformation', as explained in detail below.

5.2.1 Recognizing the value of external knowledge

I first explored how the decision to absorb new knowledge was made when new external knowledge was available. It was found that organizational strategy and specific triggering points influenced the organization's ability to identify the value of new knowledge. The organizational strategy consisted of the type of IT SMEs (Distributor, Value-Added Reseller, or System Integrator); and the focus strategy (product-focused, customer's industry specific focused, supplier-focused, and technology-focused, or no-focus strategy). Findings confirmed the work of Wales,

Parida, and Patel (2013) on interfirm technical knowledge transfer that pointed out how companies with high focus on technological knowledge tended to have lower initial knowledge transfer time from their partners. This implied that focus strategy slowed down the rate of inflowing external knowledge, which allowed enough time for a company to reach optimal transfer of knowledge to survive in a highly dynamic and rapid environment like the IT industry.

Another factor that impacted the recognition of the value of new external knowledge was the triggering point. Triggering points initiated the knowledge absorption process chain. Triggering points were: customer demand, supplier release of new product, technology shift and change, government regulations, or the willingness of the firm to expand into a new area or new territory of business.

Both strategies and triggering points to absorption factors were combined and compared with time to absorption and the risk associated with absorption to produce a decision-making matrix (see Figure 4.6). The decision matrix combined all possible strategies and triggering points to identify the likelihood of a IT SME taking action when new knowledge was available.

5.2.2 Efficacy of the knowledge transfer and transformation

There were two variables contributing to the efficacy of knowledge transfer and transformation: the mean and method of knowledge transfer, and the organizational structure.

The mean and method of knowledge transfer indicated the efficiency in the process of transferring, and the quality of knowledge as the outcome of the transfer. Boundary spanning was crucial to determine the quality of knowledge transfer. In the case studies, boundary spanning varied from company to company. The boundary

sometimes spanned beyond the physical border of the company. The actual boundary was determined by the business model and strategy of each company. However, knowledge transferring across company boundaries was not the only factor that impacted the efficacy of the transferred knowledge. Transferring across internal borders of interdepartmental or inter-team boundaries also impacted the knowledge quality. Both the external and internal boundary crossing transfer had an impact on the quality of the transferred knowledge (Beckett & Hyland, 2011). Findings showed that all factors associated with the crossing of company boundary transfer also applied to the internal boundary crossing. This means that the knowledge recipient's organizational arrangement was the determining factor for the quality of the transferred knowledge. This was a significant finding. When further exploring the absorptive capacity meta-routines, it emerged that boundary spanning was not just limited to company knowledge transfer extent but also to internal border crossing.

The study explored further the depth of knowledge of the recipient teams that were organized for external-inward knowledge transfer. In an ordinary knowledge transfer this involved a group of multi-disciplinary individuals. Two distinct types of team organization existed. The first type of team was assembled with multi-disciplinary team members for the direct transfer from the external source. The second type of the team used the existing organizational functional structure to handle the transfer. An analysis and comparison of the two types of teams showed that the multi-disciplinary team formation had higher efficacy in the transfer, and thus a higher quality of transferred knowledge. The efficacy was determined by the smoothness in transition from a knowledge discipline to another knowledge discipline. The low efficacy transfer had residual un-transferred knowledge left inside

the disciplinary team, while the high efficacy team did not have this problem. The low efficacy team required an extra process of knowledge management to overcome the nontransferable knowledge.

Organizational structure also influenced the efficacy of the knowledge absorption. Van den Bosch, Volberda, and de Boer (1999) found that the organizational formation has impact on efficiency in absorption of knowledge. For functional forms of organization, the efficiency is high, compared to the transfer in the divisional form. This finding contrast with what was learned from these case studies. For the IT SME, having an organizational form that was flexible and fewer processes and entities involved in the transfer of knowledge resulted in higher efficacy of absorption and exploitation of knowledge.

This contrasting finding may come from the fact that IT SMEs are usually small companies where employees have more of an aggregate responsibility in comparison to larger companies. In this case, flexibility becomes an important factor to ensure higher efficacy of knowledge transfer.

High flexibility results from the divisional form as the teams are equipped with empowerment to make decisions and to act with freedom. Flexibility allows teams to act to overcome any obstacles and react to problems quicker.

Moderate flexibility is the result of mixed organizational form. The mixed form combines both the functional characteristics of the functional form, that is, having a dedicated function to hold responsible for the knowledge absorption, and the characteristics of the divisional form, that is, having high responsiveness to make decisions to overcome the obstacles in knowledge absorption. However, absorption in the mixed form causes inflexibility because people from multiple departments with

various disciplines are involved, and it also requires a lengthy process in knowledge transfer.

The functional organization form appears to not be a good fit for small IT SMEs. Functional form requires employees to work in their own specific area of expertise. A special process must come into play to bridge across the boundary from department to department. This sometimes makes the absorption process rigid. In the larger organization, according to Van den Bosch et al. (1999), the functional organization form is a more economical way of handling the resources to achieve absorption. This is not so true for small organizations where resources are limited and economy of scale is hard to achieve through the separation of responsibility. The benefit of being small is fully realized in the divisional form. The mixed form combines the advantages of both the divisional and functional form that keeps the clear distinction in managing various departments, along with flexibility in handling the transformation of new knowledge. Mixed form appears to be good for organization with dedicated team to run certain projects or operations for a long time, but not the best for IT SMEs.

When reviewing organizational structure and absorptive capacity meta-routines from all cases, it was found that all meta-routines were valid and comprehensive when absorbing new external knowledge. However, there were slight deviations from Lewin et al.'s (2011) original work with respect to organizational structure, as summarized in the following figure.

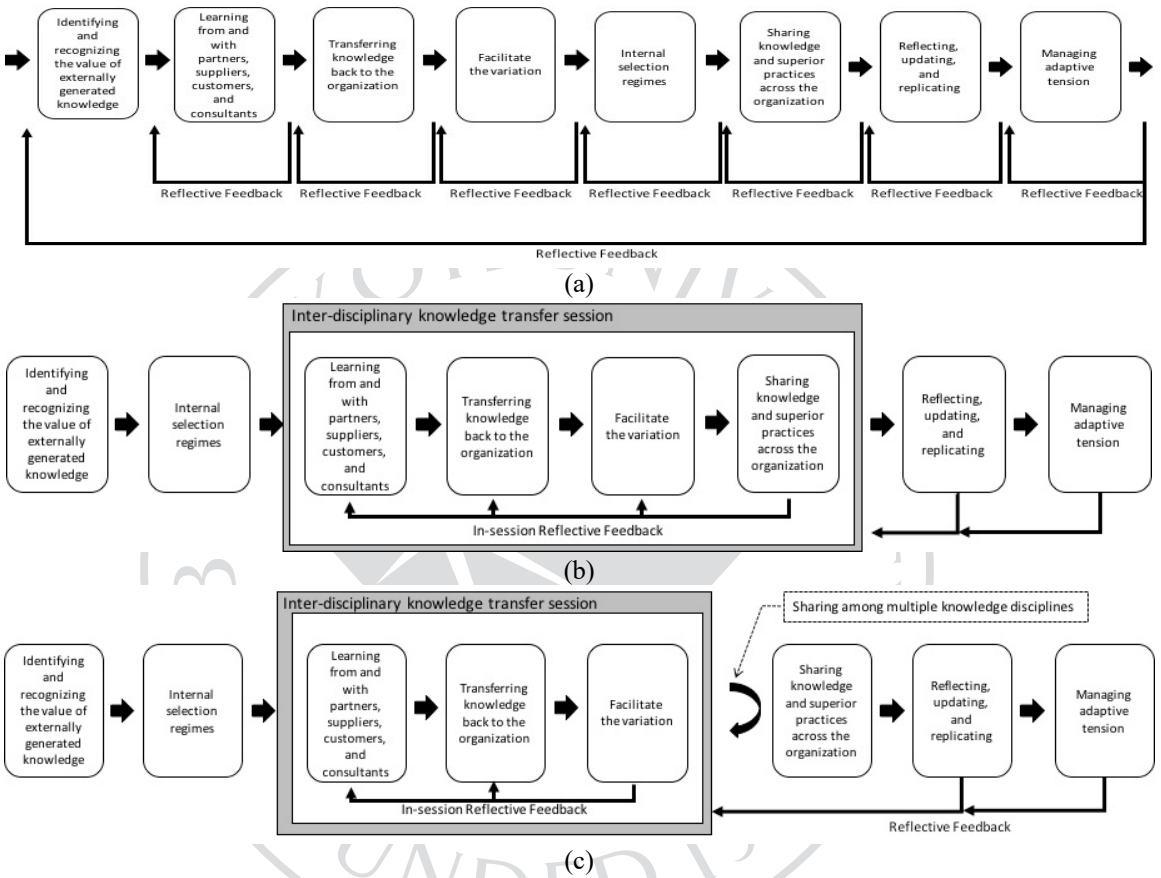


Figure 5.1: Absorptive capacity meta-routines variations in association with organizational structure (a) in functional form, (b) in divisional form, and (c) in mixed form

A review of the absorption process of Companies A and T, which have the functional form, showed that all absorptive capacity meta-routines were sequentially carried out step by step. The absorption process is shown in Figure 5.1 (a). It was found that in contrast to the Lewin et al. (2011) original work, the feedback process occurred at every stage, from beginning to end, in these two companies.

However, the meta-routines differed from the Lewin et al.'s (2011) original work in companies with a divisional organizational structure and mixed organizational structure as shown in Figure 5.1 (b) and (c). The major difference from the original work was the order of the internal selection routine. In the divisional and mixed organizational forms, internal selection was done in the very early phase of the process. This came from the fact that IT SMEs were small companies with a high agility to respond to external opportunities. The decision to absorb was made by the top executive of each company. The decision was always made with thorough consideration of the impacts and consequences, and was unlikely to be overruled in the later phase. Once the decision about the new knowledge to absorb and the organizational arrangement was made, the process of internalization of the new knowledge began.

The second major difference from the original construct was the combination of the inter-disciplinary transfer processes. For the divisional organizational structure of Company C and D, the process of learning from and with partners, transferring back to the organization, facilitating variations, and sharing knowledge across the organization was achieved in one single step. The mixed formation of Company B and T had the grouping of inter-disciplinary transfer session to contain only the first three sub-processes (learning from and with partners, transferring back to

organization, and facilitate variations), leaving the process of transferring across the organization out of the initial transfer.

Grouping the inter-disciplinary knowledge transfer into one session to contain these sub-processes meant the transfer could occur without crossing the inter-disciplinary knowledge transfer boundary. This resulted in satisfactory efficacy of the transferred knowledge. This was because there was no need for the extra mediating functions of the gatekeeper, interpreter or translator to obtrude in the line of transfer. Thus, a collective cognition and understanding occurred among individuals in the session. Misinformation and false understanding were amended through internal feedback routines within the session.

5.3 Discussion and conclusions on research sub-question 1 (RQa)

Findings related to research sub-question 1 (RQa) that is "How do absorptive capacity meta-routines explain the absorption of new knowledge in IT SMEs?" are compared to existing literature in the following sections. The exploration at the micro foundation level of processes and routines was made to refine current understanding of absorptive capacity meta-routines (Mariano & Al-Arrayed, 2016).

Identifying and recognizing the value of externally generated knowledge. With respect to this absorptive capacity meta-routines, Cranefield and Yoong (2007) and Fernhaber and Patel (2012) proposed the key role of gatekeepers as the bordering gateway in transitioning external knowledge into the company. This was confirmed in this study since gatekeepers appeared to be key in each examined case. It was also found that at every connecting border, when knowledge transfer happened between two groups of different knowledge disciplines, gatekeepers were employed. Gatekeepers' role was not just as coordinators in the interactions among the

knowledge sources and the knowledge recipients; they also performed the function of interpretation when multilingual knowledge transfer was involved. Sometimes, the person who performed this role also acted as an advocate for the assimilation of the new knowledge across the entire organization.

Learning from and with partners, suppliers, customers, and consultants. The strongest factor pertaining to the transfer of knowledge from external suppliers and stakeholders was found to be the social relationship between the company and those external entities. According to findings, companies invested in activities to develop relationships with their supplier, partners, and customers. Other related factors from the literature review included common knowledge relatedness (Lane & Lubatkin, 1998; Y.-L. Wang et al., 2009; Yeoh, 2008), accessibility (Roberts et al., 2012), and management support (Flatten et al., 2011). These factors all surfaced in the analysis of data. Knowledge relatedness resulted in the ease of knowledge transfer. Accessibility to knowledge was very much supported through a technology-assisted knowledge-based work set, or with prototyping. All cases used these artefacts to enhance the knowledge transfer from suppliers and stakeholders.

Transferring knowledge back to the organization. Pablos (2006) proposed that the transfer of knowledge with a high degree of tacitness required the use of prototyping to mediate the transfer. Technical knowledge in the form of documentation available from the supplier was sometimes not enough. The knowledge that was transferred needed to leverage the company to the degree of competitive advantage in order to serve the customers' needs.

Another difficulty of knowledge transfer as proposed by Pablos (2006) was causal ambiguity. From the analysis of findings discussed in section 4.3, prototyping

helped overcome this critical issue. The prototype allowed the knowledge absorbing team to simulate all causes and effects of possible real-world problems. These problems were identified and the solutions solved prior to supporting the customers.

According to Desouza and Paquette (2011), a pragmatic boundary occurred when pure communication could not lead to understanding, unless some actions were involved. The use of prototyping, as confirmed in the findings reported in section 4.3, helped cognitive understanding of the context that was transferred. IT SMEs' engineers often did have a problem with English. From collective evidences, the knowledge transfer went beyond syntactic trasfer, and crossed into semantic and pragmatic layers of understanding. The context matterred. Prototyping helped engineers understand different contexts, and gave them confidence when supporting the customers.

Facilitating variations. According to Bennet et al. (2015), coaching and mentoring is the best technique to help with the transfer of tacit knowledge. The foundation of coaching and mentoring is good constructive communication between members and is facilitated through good relationships. The case studies confirmed these assumptions and showed that vision sharing occurred at this stage. Companies organized communication sessions as well as discussions of the new target and shared the vision at this stage.

Managing internal selection regimes. For IT SMEs, the decision to adopt started in the early stage of absorption since organizations were small and the decision maker was always the top management. Once the decision about absorption was made, internal selection was always considered as a team. Knowledge traits matching and resource allocation was planned. This was the major difference from the original

construct of Lewin et al.'s (2011) absorptive capacity meta-routine work, where internal selection occurred later in the process after enough information was available, and thus represented a key finding to extend the original work on meta-routines.

Sharing knowledge and superior practices across the organization. According to Bennet and Bennet (2004), organization optimal complexity was achieved by balancing the organization process from too rigid or too loose to find the right combination. At this stage, the organization boundary extent of knowledge transfer was the mechanism to manage complexity. From the analysis of cases it was found that Company A chosen not to have their internal team to perform CCTV installation company-wide, but had signed contracts with their regional partners to offshoring this task. Hence, the knowledge transfer network went beyond the company physical boundary and extended outside to include all the partners on the network. Another example was Company T. They did not keep their high experience staffs in-house, but rather encouraged them to form their own company, the sub-associate company (from our study, Company D is the sub-associate company of Company M). The relationship between Company M and their sub-associate company was based on mutual trust. Company M knowledge transfer network was extended beyond their physical boundary to cover Company D, the sub-associate network.

The business engagement model dictated the scope of knowledge transfer. For complex knowledge transfer extents, such as the case of company A and B, the extent spanned beyond the firm’s boundary. In this case, the transfer involved different types of knowledge recipients with different interests and different levels of knowledge. This transfer confirmed that the organizational engagement model defined the knowledge network spanning extent which related to the organization complexity.

Reflecting, updating, and replicating. At this stage, the absorbed knowledge was refined, extended, and leveraged with the existing competencies (Melkas et al., 2010). Findings reveled that a company performed a knowledge management practice by providing venues and organizing sessions for knowledge and experience sharing. Feedback was a major process at this stage. However, all cases emphasized a feedback routine at every stage. The lessons learned and feedback sharing venues were arranged, using both physical workspace and technological virtual workspace to facilitate the sharing at regular time intervals.

Managing adaptive tension. According to existing research, strategic flexibility, innovation, and performance (Todorova & Durisin, 2007) defined absorptive capacity derived competitive advantage. Since the key activity of managing adaptive tension were to compare existing performance with those outside an organization (Lewin et al., 2011), financial measures and key related studies that indicated the efficacy of a company deploying absorptive capacity, were taken into consideration. Two research studies were considered: the study by Kostopoulos, Papalexandris, Papachroni, and Ioannou (2011) which proposed that absorptive capacity had a positive impact on Return on Sales (ROS) and Return on Assets (ROA); and the study by Zahra and Hayton (2008) which showed that absorptive capacity had an impact on the firm's profitability.

The chosen financial performances were from the selected measuring indexes by the Department of Business Development of Thailand (DBD), which were used as the standard comparative figures to compare all the firms' performance in Thailand. The study here focused on the indicators considered by the DBD.

The three financial performance indicators—Total Asset Turnover, Total Accounts Receivable Turnover, and Gross Profit Margin—were determined. The decision to use these three indicators was because they indicated the firm's performance. Total Asset Turnover indicated the firm's ability to turn its assets into revenue. This ability came from the utilizable knowledge that leveraged the firm's performance. The Total Accounts Receivable Turnover was the firm's ability to turn the accounts receivable into cash by collecting the commenced service delivered to the customers. Total Accounts Receivable Turnover was strongly tied to the company's cash flow. The ability to turn the waiting-to-be-collected cash into collectible cash reflected the ability of the firm to leverage its knowledge to gain commercial advantage. The Gross Profit Margin was the gap between the revenue and cost of goods sold. This gap came from the customers' willingness to pay more for the same service. In IT SMEs, products were the same. Instead of competing for lowest price, the customer's selection came from the differentiation of the level of knowledge the company could offer to the customer.

The results of the analysis of the case studies showed that all three financial figures were tightly related to the pragmatic level of absorptive capacity. These three indicators could be used as the unit of measurement for a firm's ability in exercising absorptive capacity to gains in its intellectual capital and competitive benefit.

The last factor that had a negative effect on adaptive tension was the knowledge spillover. According to Lane et al. (2006), knowledge spillover tides with R&D activity. Even though IT SMEs were not involved with R&D, there was knowledge spillover in the sense that the new functionality that served specific requirements for some specific customers could become available to competitors. Knowledge spillover

occurred when a firm educated the market for its new technological capability. The firms that were concerned most with knowledge spillover were companies A and B, where both were the distributor. The concern was less for other types of IT SMEs.

5.4 Discussion and conclusions on research sub-question 2 (RQb)

Findings related to research sub-question 2 (RQb) that is "What factors contribute to the successful or unsuccessful absorption of new knowledge in IT SMEs?" are compared to existing literature in the following sections. The focus here was on exploratory regimes that comprised agent role, behavioral factor, impact factor, and processes and routines. From absorptive capacity exploratory regimes (Senivongse, Bennet, & Mariano, 2017; Senivongse et al., 2014), the four regimes that were to have different impact at different stages of meta-routines were used as guideline for micro-level exploration.

Agent roles. The transfer boundary level, as defined by Desouza and Paquette (2011), were at the syntactic, semantic, and pragmatic levels. When the transfer was at the syntactic level, translators and interpreters were required. When the transfer of technical knowledge had surpassed the syntactic level and progressed well into the semantic level, the function of the translator and interpreter were no longer necessary. Communication at this level happened using the technical context, which was possible between a sender and recipient that had matching levels of knowledge traits.

With the use of an intermediating agent to perform the liaison and interpretation roles, the communicated message could be distorted and biased. This had impact on the efficiency of the transfer and the efficacy of the transferred knowledge. However, there was a need for these roles to occur at the crossing border of one knowledge

discipline to another (Cranefield & Yoong, 2007). The more complex the organization transferring knowledge network, the more intermediating agents were needed.

However, the sooner the transfer could surpass the syntactic level and progress into the semantic and pragmatic levels (Desouza & Paquette, 2011), the less the ambiguity of the transfer message and the higher efficacy of the transferred knowledge. This supported the reason why the use of prototyping in the case examined could help with the transfer as the knowledge recipients would be exposed to both the explicit and tacit part of the knowledge from a real environment with actual experience. The company could bypass the need for a human agent to connect to the knowledge source, and delved right into the knowledge transfer space.

Behavioral factors. Table 2.25 reported all relevant literature regarding behavioral factors. However, not all behavioral factors surfaced during the analysis of data, as reported in Table 5.1.

Table 5.1: Summarizing behavioral factors from literature review that do and do not emerges in the case studies

Behavioral Factors extrapolated from Literature Review	**References**	**Emerged in this research study**	
		Yes	**No**
Intuition	Sun and Anderson (2010)		X
Incentives that drive for absorption	Schmidt (2010)	X	
Trust	Lane, Salk, and Lyles (2001)	X	
Not-invented-here (NIH syndrome)	Lichtenthaler and Ernst (2009)		X
Buy-in	Lichtenthaler and Ernst (2009)	X	
Common interest across organization	Alin, Taylor, and Smeds (2011)	X	
Group-level socio-psychological interpretation	Sun and Anderson (2010)	X	
All-stored here syndrome (Knowledge generated internally is to be used inside the firm)	Lichtenthaler and Ernst (2006)		X
Related-out syndrome (Strong reliance on external in-sourcing, omit building own capabilities)	Sun and Anderson (2010)	X	
Managerial encouragement to share knowledge	Sun and Anderson (2010)	X	
Only-used-here syndrome (Incomplete or underutilization of existing knowledge due to fear of strengthening competitors)	Lichtenthaler and Ernst (2006)		X
Sell-out syndrome (overvaluation of external exploitation potential and undervaluation of consequences for internal knowledge exploitation)	Lichtenthaler and Ernst (2006)		X
Behavior output controls	Li, Lee, Li, and Liu (2010)	X	
Reward and recognition	Sun and Anderson (2010)	X	

The behavioral factors that did not emerge in this study were: intuition, non-invented-here syndrome, all-stored here syndrome, only-used-here syndrome, and sell-out syndrome.

Intuition (A. Bennet & Bennet, 2008; Crossan, Lane, & White, 1999; Sun & Anderson, 2010) was not used in IT SMEs in the decision-making process for new knowledge absorption, which was the key ignition point to the entire absorption process. For IT SMEs, poor decision making meant a capital expenditure. The

selection was to be done carefully. Intuition, heavily dependent on the knowledge and past experiences of the decision-maker, always came with uncertainty and prediction for market response. Using intuition did not allow for any mistakes. Thus, the decision-making based on intuition did not surface.

The not-invented-here (NIH) syndrome lead to resistance of accepting knowledge from the outside (Katz & Allen, 1982; Szulanski, 1996). NIH could happen with the group whose members possessed a monopoly of knowledge in the area of specialization, enough not to consider the possibilities that outsiders may produce new ideas or knowledge relevant to the group (Katz & Allen, 1982). According to the case studies, the NIH syndrome did not appear in IT SMEs. This was because IT SMEs did not have their own R&D. They relied on knowledge from external sources. In this environment, NIH was not a behavioral factor that had impact on this industry.

According to Lichtenthaler and Ernst (2006), the NIH syndrome was the diametrical opposition of the buy-in syndrome. NIH totally depended on internal knowledge, while buy-in focused on external knowledge only. From the analysis of data, it came out that the buy-in existed in the stage of *Identifying and recognizing the value of externally generated knowledge* and the *Managing internal selection regimes* of the absorptive capacity meta-routines. For IT SMEs, the NIH syndrome had a negative impact and the buy-in syndrome complimented the positive impact on external knowledge absorption.

All-stored here syndrome, only-used-here syndrome, and sell-out syndrome: According to Lichtenthaler and Ernst (2006), the all-stored-here syndrome was the behavioral factor that had a negative impact on the knowledge accumulation process.

The new knowledge that was acquired and integrated with the existing knowledge was used by the firm for internal purposes only. For IT SMEs, all external knowledge, once decided to be absorbed, was combined with what was known and passed on through the knowledge exploitation process to bring out the firm's competitive advantage. The same applied to the only-used-here syndrome and the sell-out syndrome; these behavioral factors did not exist in the IT SMEs because all combined and developed knowledge were utilized. Knowledge would not be held back, non-disseminated, because the benefits to the firm when exploiting this newly developed knowledge were well understood.

Additional behavioral factors that emerged from the analysis of data and that complemented the positive reinforcement of knowledge absorption were trust (Lane et al., 2001), together with negative reinforcements such as knowledge hoarding (Elwyn, Taubert, & Kowalczuk, 2007) and psychological safety (Cauwelier et al., 2016). These additional behavioral factors manifested in the Thai context. Negative reinforcements could be overcome by knowledge enhancing activities such as the building of trust relationships and the development of a learning mindset.

According to Lane, Salk, and Lyles (2001), the transfer of knowledge between two parties requires active engagement of the transferor and the transferee, as well as the supportive cultural and cognitive preconditions. Trust is a critical part of knowledge transfer because it helps the knowledge recipient to understand the knowledge the transferor is offering. Trust has two dimensions that are relevant to transferring and learning. The first is a willingness to risk vulnerability, which is required for openness and sharing of valuable secret (Inkpen & Beamish, 1997). The second dimension is the confidence that the transferred knowledge will impact the

adoption and taking of actions over the new transferred knowledge (Barney & Hansen, 1994). “The greater the trust in the relationship, the more willing all parties will be to share and exchange information” (Lane et al., 2001, p. 1141). Trust also helps lower the costs and the need to monitor behavior when the transferred knowledge is being implemented (Amy Edmondson, 2014). Trust is considered a relational capital (Lichtenthaler, 2008) or social capital (Macpherson & Holt, 2007), hence it is a socio-psychological learning factors that involves changes in cognition and behavior (Sun & Anderson, 2010). From the case study analysis, trust was found to have important influence on the efficacy of the knowledge transfer. Companies in the case studies allocate time and cost for their employees to build trust between their supporting suppliers and partners, as well as their customers. One of the top executive from one of the observed company (Company T) had devoted himself to establish trust by being available for customers’ call on 24 hour services.

Knowledge hoarding occurs when the source of knowledge (the transferor) does not wish to transfer the knowledge to the recipient (the transferee). According to Szulanski (1996), the two characteristics that lead to knowledge stickiness are—(1) the transferor lacks of motivation to transfer the knowledge, and (2) the transferor is not perceive as reliable. For the first characteristic, the lack of motivation comes from the fact that the source may be reluctant to transfer the knowledge. The transferor fears that the transferred knowledge will result in losing ownership which may cause losing the privilege position or superiority. For the second characteristic, the transferor that are perceived as unreliable, results in lack of trustworthiness. This makes the initiation of the transfer difficult. When one of the two characteristics presents, it may cause knowledge hoarding (Koskinen, 2012). From the case study

analysis, it was found that knowledge hoarding existed, especially in those firms that required extensive knowledge transfer from a team to another. The more internal cross-border transfer happened, the more likely knowledge hoarding occurred. Company A and T were the two firms that provided evidence of knowledge hoarding. This evidence indicated that knowledge hoarding manifested when knowledge was transferred from a team to another. To overcome knowledge hoarding, efficient practices of knowledge management was required (Elwyn et al., 2007).

Psychological safety is another behavioral factor that emerged in all cases. There was strong evidence indicating the presence of fear. These fears came from the concern of potentially humiliating oneself in public. The individual was afraid of asking stupid questions, of using incorrect grammar, or of using inappropriate words when communicating in English. The fear of losing face dominated their actions and prevented these individuals from taking action. There were simple ways to overcome these fears. All the case study companies were using a gatekeeper as the language translator when communicating for knowledge transfer. The size of the learning group was kept small. Segregating transfer recipients and arranging them into transfer groups comprised of the same knowledge discipline helped overcome fear as well.

Figure 5.2 lists the impact factors that have an influence on absorptive capacity and meta-routines as per Lewin et al.'s (2011) work. In the initial stage of identifying knowledge, the triggering point becomes the major factor of influence. It follows the efficacy of knowledge assimilation during assimilation and transformation processes. The transfer means and method, knowledge transfer and transformation space, and quality of the transferred knowledge are at the heart of assimilation and

transformation process of knowledge absorption. The measuring indices and the concern over knowledge spillover are placed at the knowledge exploitation level.

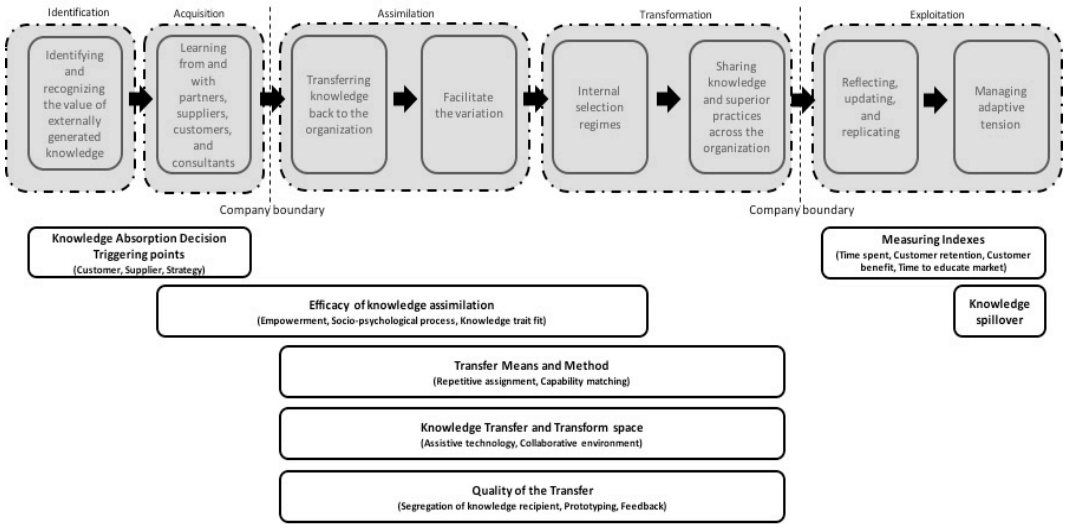


Figure 5.2: Impact factors as per Lewin et al.'s (2011) work

Several processes and routines surfaced from data analysis. Figure 5.3 represents the processes and routines in accordance with the absorptive capacity meta-routines findings. It represents the sub-processes and routines emerged from data analysis. The effort in mapping and generalizing at higher levels of details had the intent to refine the work of Lewin et al. (2011). The process followed to create Figure 5.3 was based on 'Swimlane' process map (Boutros & Purdie, 2014). This process helped fill the gaps at the micro-routines level (Mariano & Al-Arrayed, 2016) and process performance level (Salvato & Rerup, 2011).

In details, at the first stage i.e., *Identifying and recognizing the value of externally generated knowledge* (Figure 5.3a), triggering points contribute for new knowledge to emerge. The gatekeeper initiates local knowledge search. Once the new knowledge with supportive information is identified, the proposals for knowledge

absorption are made to the decision maker. Commonly found from the case study analysis, the decision maker corresponds to the top executive of IT SMEs.

At the stage of *Learning from and with partners, suppliers, customers, and consultants* (Figure 5.3b), formal knowledge transfer and prototyping are requested to stakeholders. This experimental learning is a process of performing quality control. At this stage the proper knowledge transfer from the external sources is provided to the lead engineers. The internal lab setting is established to simulate the technical operations of the new products or services. The technical exploration of knowledge is conducted. This is a part of the knowledge confirmation and quality assurance process.

At the stage of *Transferring knowledge back to the organization* (Figure 5.3c), the knowledge recipient teams are formed. The transfer will be done from the pioneering team to this knowledge recipient team. The recipient team can come from multiple disciplinary departments or from a single department, depending on structural arrangements. At this stage, the knowledge is disseminated.

At the stage of *Facilitating variations* (Figure 5.3d), each underlying team from each knowledge discipline share and transfer to others departments. Each department is responsible to interpret and integrate the knowledge under their work context. The result of integration is communicated to the decision maker.

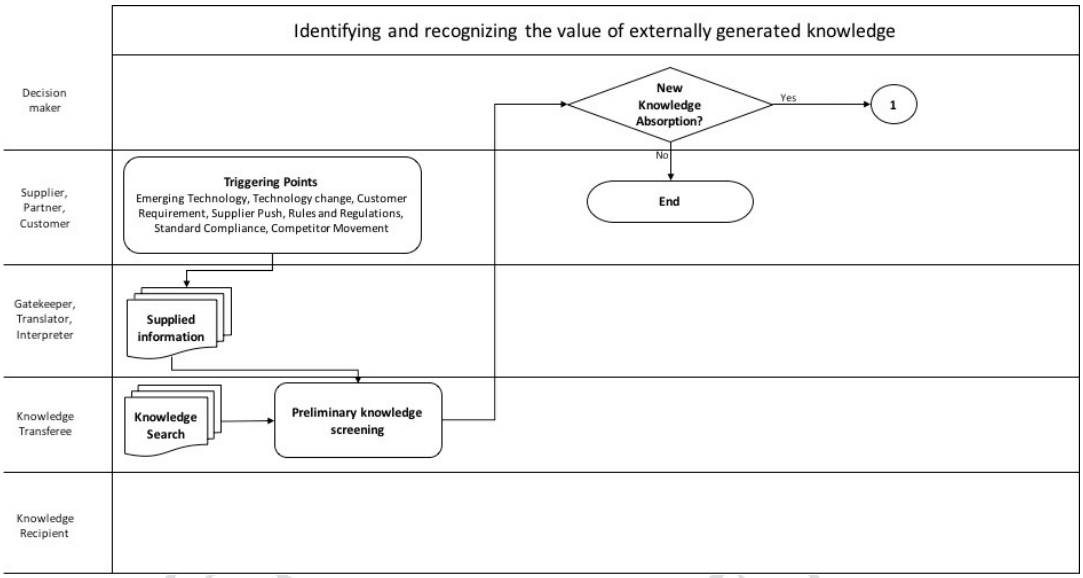
At the stage of *Managing internal selection regimes* (Figure 5.3e), the results of the integration by each team are mapped with existing resources. This sub-process is called ‘Knowledge Fit’. If the knowledge is ready for implementation, then the absorption can proceed, otherwise it must be terminated. From the analysis of cases,

the internal selection regimes of IT SMEs start when the decision maker authorizes knowledge absorption.

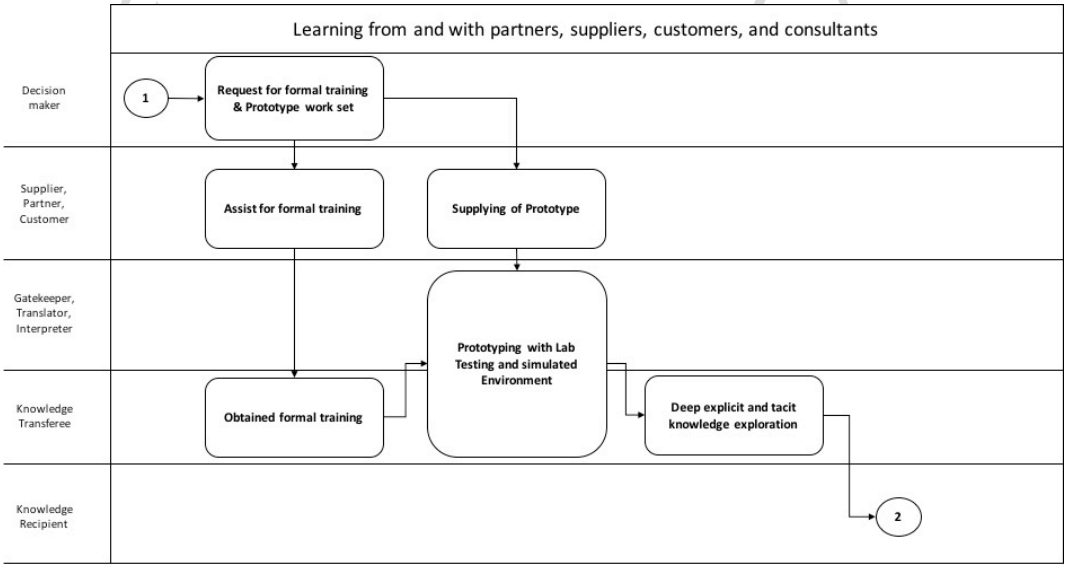
At the stage of *Sharing knowledge and superior practices across the organization* (Figure 5.3f), new knowledge is disseminated across the entire organization. The coverage of dissemination depends on knowledge sharing extent. For example, Company A's knowledge sharing extent goes beyond its physical company boundaries and includes partners' network.

At the stage of *Reflecting, updating, and replicating* (Figure 5.3g), the new knowledge is implemented to meet customers' expectations. Feedback provides information about knowledge exploitation. Lessons learned from relevant implementation teams are discussed internally.

At the stage of *Managing adaptive tension* (Figure 5.3h), the measurement indexes are collected and used as indicators of knowledge exploitation. The results are shared via feedback routines with all relevant people.



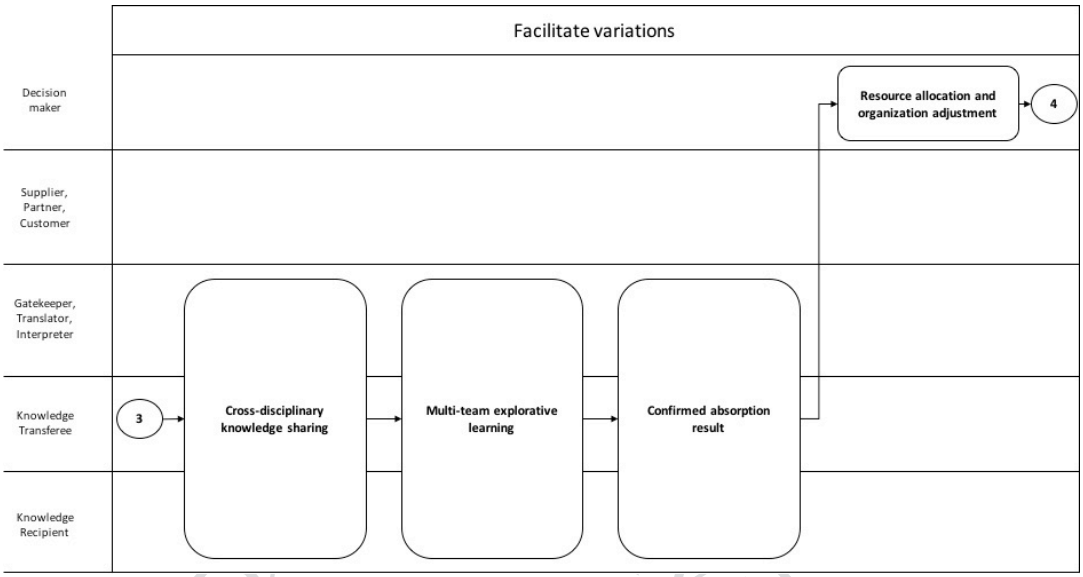
(a)



(b)

(Continued)

Figure 5.3: Processes and routines summary of activities as explored in detail mapped into absorptive capacity meta-routines



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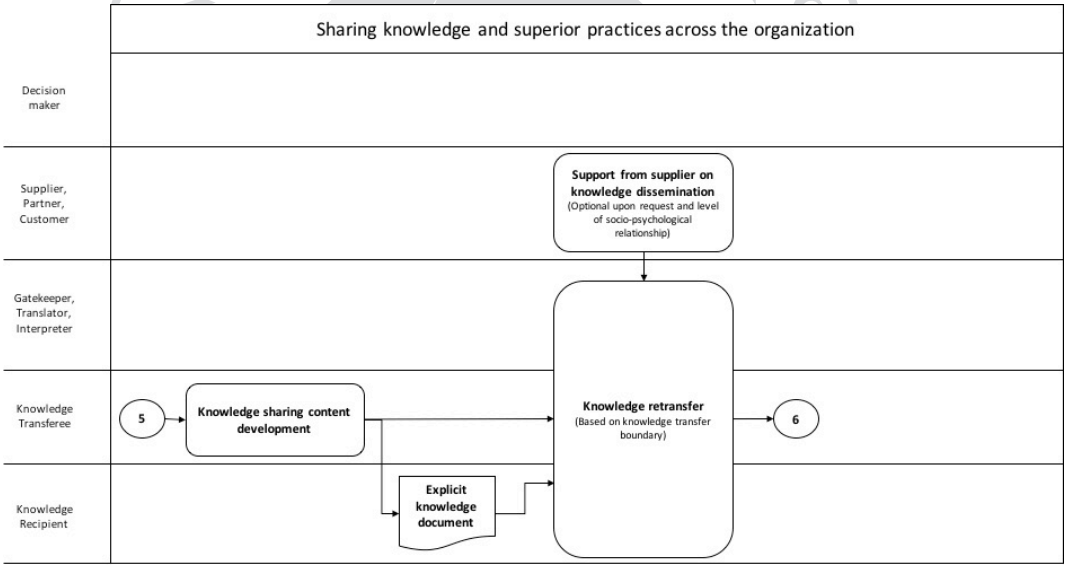

(f)

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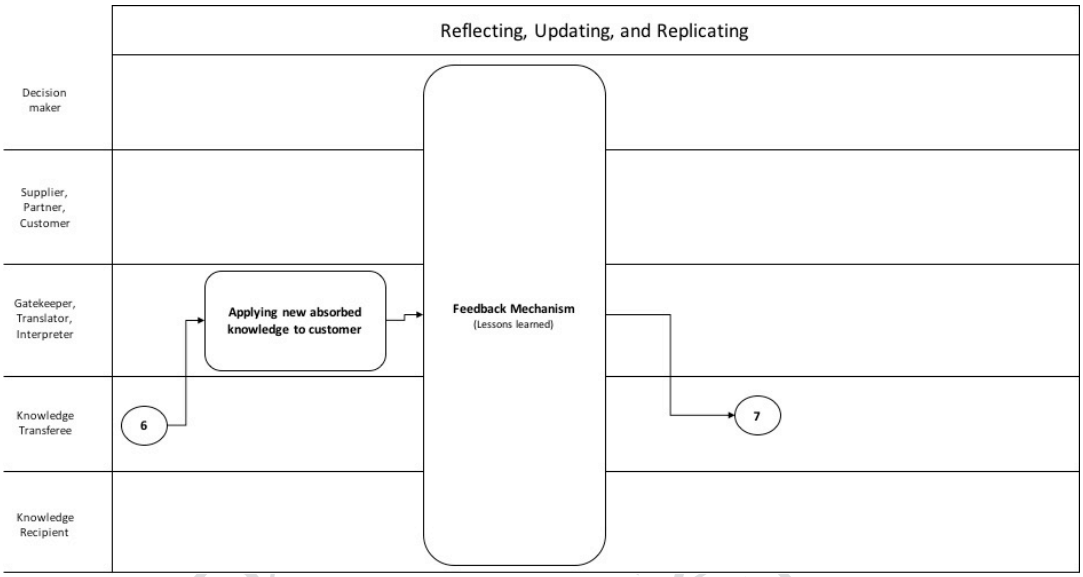
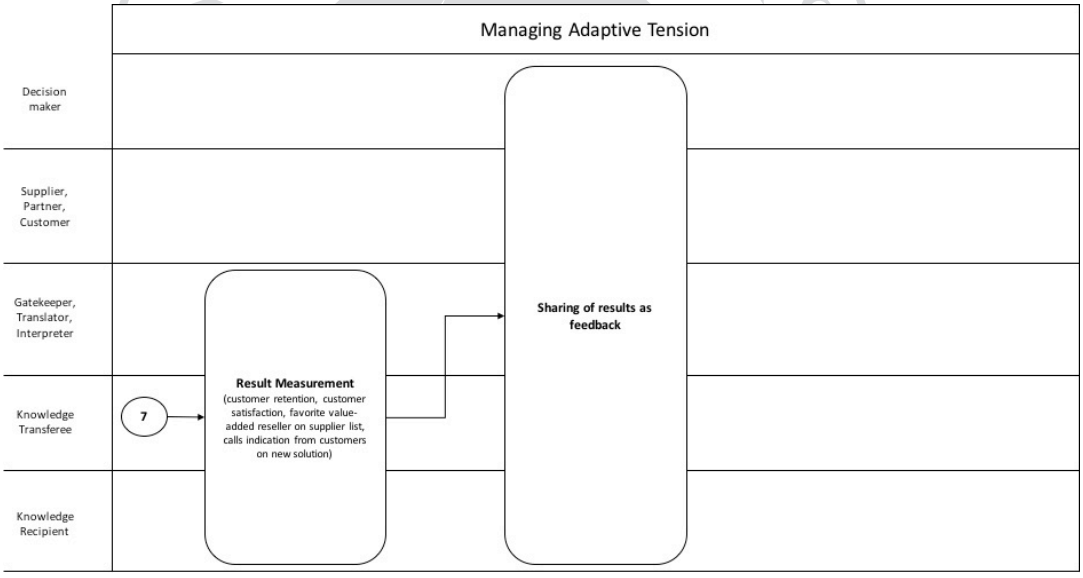
Figure 5.3 (Continued): Processes and routines summary of activities as explored in detail mapped into absorptive capacity meta-routines



(g)



(h)

Figure 5.3 (Continued): Processes and routines summary of activities as explored in detail mapped into absorptive capacity meta-routines

5.5 Contribution to literature

This research study contributed to existing literature on absorptive capacity and absorptive capacity meta-routines in the several ways, as explained in the following sections.

5.5.1 Variations of absorptive capacity meta-routines from the Lewin et al.'s (2011) work

Absorptive capacity meta-routines are reformulated to reflect the absorption process of IT SMEs, with all relevant factors pertaining to emerged meta-routines and exploratory regimes. There are three major refinements to the original construct of the absorptive capacity meta-routines.

The first refinement regards the process of *identifying and recognizing the value of externally generated knowledge* and the *managing of internal selection regimes*. In the Lewin et al.'s (2011) original work, the internal selection regimes appear as the 4th sequential meta-routines. For IT SMEs, the internal selection regime is executed in as early as the stage of *identifying and recognizing the value of externally generated knowledge*. This is because decision making in IT SMEs is most often made by a single executive or a few executives. The decision maker considers thoroughly what knowledge is to be absorbed along with resources allocated to handle the absorption. It is very unlikely that the decision will be re-considered. This allows a combination of the two processes with blurred boundaries among them.

The second refinement regards the physical boundary of knowledge transfer. In the original construct, the boundary refers to physical boundary of the organization. Knowledge crosses this boundary twice—inbounding and out-bounding. Inbounding occurs when supplier transfers knowledge into the organization. Outbounding

happens when knowledge is transferred from the organization to the customers. From the analysis of data, it showed that the knowledge transfer boundary varies among companies according to the strategic business partnership engagement. When company requires direct help from partners—like those of Companies A and B, the knowledge transfer boundary is extended beyond the physical boundary of the company to that of the remote partners. In other word, the transfer of knowledge across boundary is not limited to the inter-departmental boundary, but also the external extended business boundaries.

The third refinement regards feedback which, in the original construct, occurred at the last stage of *managing adaptive tension*. From the analysis of data, feedback occurs at every stage, regardless of knowledge exploitation. Feedback occurs with periodical routines, such as weekly staff meetings, or at certain milestones, such as at the conclusion of a project proposal or at the commencing of a project.

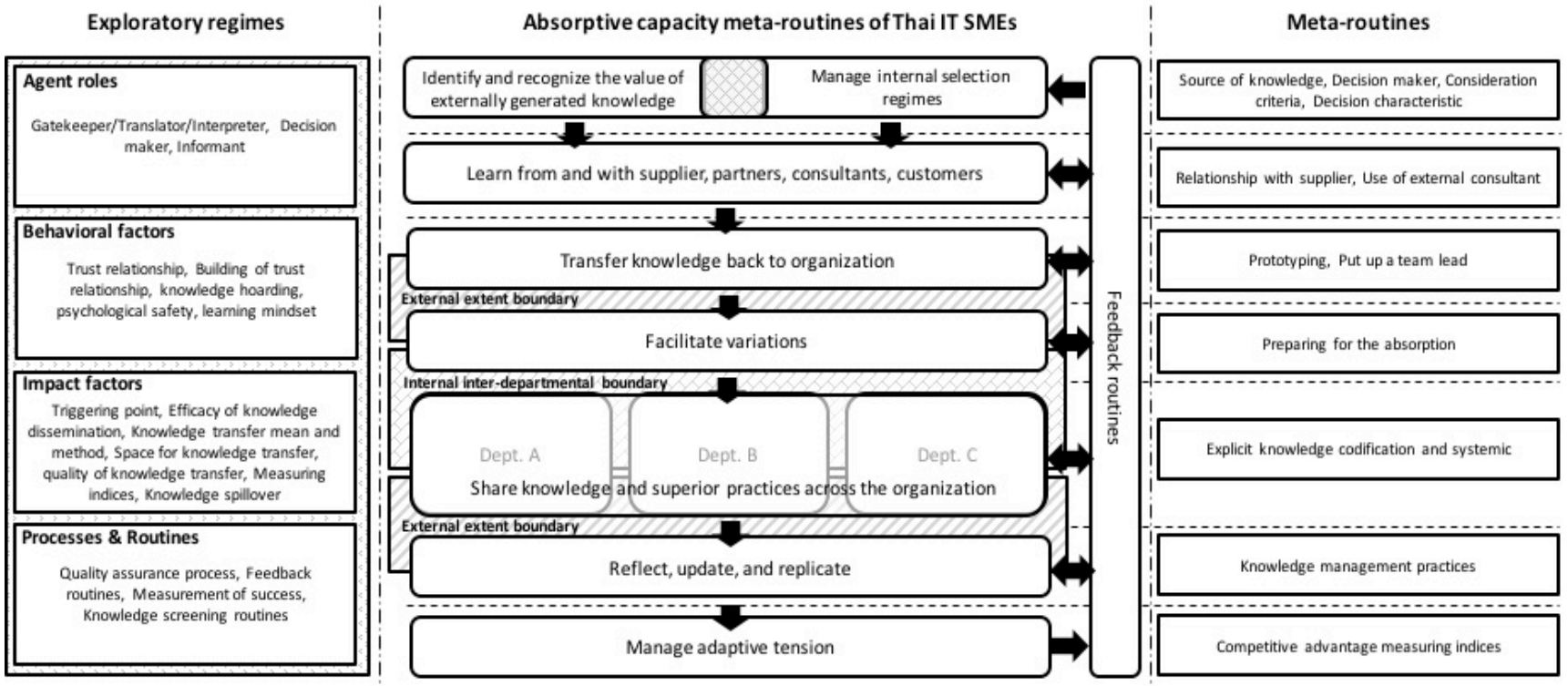


Figure 5.4: Absorptive capacity meta-routines for IT SMEs

5.5.2 Financial performance as a measuring indicator for the value of absorptive capacity of a firm

One key contribution of this study regards the financial performance indicator introduced to evaluate absorptive capacity. The Total Asset Turnover, Total Account Receivable Turnover, and the Gross Profit Margin are the three financial performance indicators that directly reflect the value of a firm's absorptive capacity. From this research study, it is found that the level of effort put into the development of absorptive capacity has a direct positive impact on the level of the three indicators, contributing to a quantitate measurement of absorptive capacity and related constructs.

5.5.3 Absorptive capacity under the light of dynamic capabilities.

From a dynamic capabilities perspective, this study contributed to a better refinement of absorptive capacity that is considered a capability to process the absorption of new knowledge with influences on a firm's performance and competitive advantage via its operational capabilities (Wang & Ahmed, 2007).

The conclusion from Pavlou and El Sawy (2006) and Wang and Ahmed (2007) on dynamic capabilities as illustrated in figure 5.5 indicates that absorptive capacity cannot have direct impact on the firm's competitive advantage, unless there is an intermediate capability, called 'operational capability'. Thus, dynamic capabilities treat absorptive capacity as the impact factor to the operational capability in order for the firm to leverage the external knowledge absorption to gain competitive advantage. Firms must adjust their operational process and routine to accommodate the new absorbed knowledge. This study reveals a contradictory result. Absorptive capacity,

by itself, can have direct impact to firm's competitive advantage, as shown by the dotted line in figure 5.5.

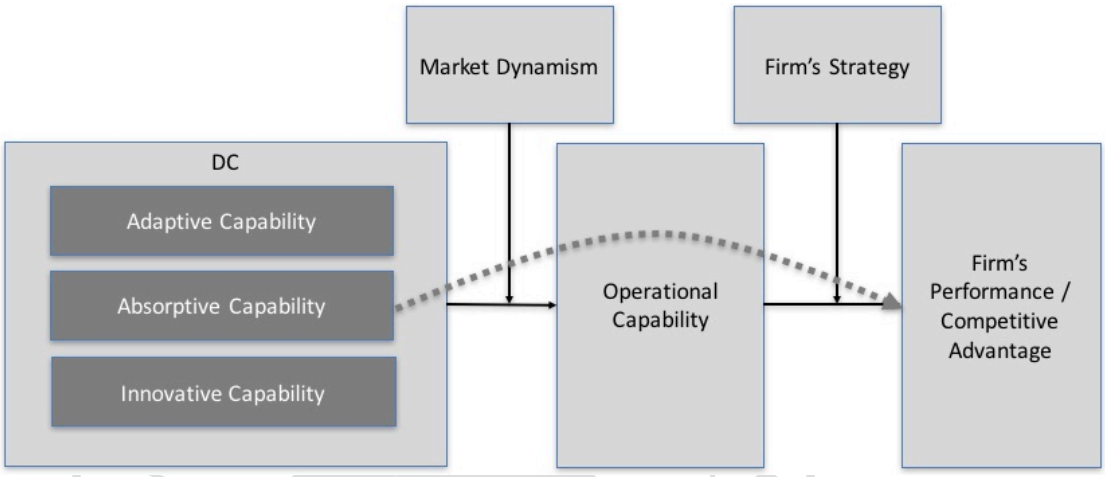


Figure 5.5: Dynamic Capabilities Discussion with Absorptive Capacity

Source: Adopted from Pavlou and El Sawy (2006) and Wang and Ahmed (2007)

From the analysis of empirical evidence, it was found that absorptive capacity had a direct impact on three financial performance indicators i.e., Asset turnover, Account Receivable Turnover, and Gross Profit Margin. Since these three financial performance indicators measure the new knowledge impacts, firms that offer products similar to their competitors can differentiate themselves through the development of innovative solutions from the emergence of new knowledge. The ability of the firm to turn existing resources (assets) into more revenue, faster the delivery of services, commence the project and collect the revenue, and sell similar products with higher margins makes absorptive capacity key to the enhancement of performance and competitive advantage.

Compared to the work of Wang and Ahmed (2007) who defined two additional dynamic capability i.e., adaptive capability and innovative capabilities - where the former refers to a firm's ability to identify and capitalize the market opportunity, while the latter is a firm's ability to develop new products and markets – the analysis of the IT SMEs found that these firms did not develop new markets and innovate mainly through integration to fits customers' needs. Thus, innovation emerged as an outcome of absorptive capacity.

Furthermore, since market dynamism influence dynamic capabilities (Eisenhardt & Martin, 2000) with a combination of factors that includes technological change, regulatory factor, economic cycle, and the change of competitive nature (Wang & Ahmed, 2007), it is important to recognize this market dynamism. From the analysis of cases, it was found that triggering points initiated new knowledge absorption and that they included emerging technology, technological change, customer requirements, supplier push for new knowledge absorption, rules and regulation changes, standard compliance requirements, and competitor movements. Absorption thus occurs through screening process to identify new knowledge as a step that precedes capability developments. Dynamic capabilities must thus not overlook the existence of absorptive capacity and must include further studies that combine absorptive capacity with dynamic capabilities.

5.6 Contribution to practice

The *Decision matrix tools to identify if new emerging knowledge is to be absorbed into an organization* that was developed has contributed to practice in several ways.

The first contribution to practice refers to the likelihood matrix (Figure 4.6). The purpose of this matrix is to look at the characteristics of the firm and to predict how

the firm will react when new external knowledge emerges. This tool is based on the firm's ability to identify the likelihood of the decision to be made for new knowledge absorption. Decision making of knowledge absorption is complex (Bennet & Bennet, 2004). The decision is composed of multiple components. In this study, it is found that the type of IT SME, focus strategy, and triggering influenced the absorption decision. Each component is evaluated with risk and time to absorption through an attribution of weighs. Each component, when combined with other components, determines the level of likelihood that new knowledge will be absorbed by that firm when available.

Another contribution to practice refers to the development of an internal selection regimes tool (see Figure 4.12). This tool helps with the decision making of whether to pursue or drop knowledge absorption. This decision is based on two factors i.e., the knowledge traits fit and the effort to allocate resources to facilitate absorption. This tool will help decision makers decide on the worthiness of the knowledge and whether absorption is to be pursued.

5.7 Future Research

A first possible area of future research could regard the analysis of some strategic factors identified in this study that appear to influence absorptive capacity. These factors are: types of IT SME, focus strategy, and triggering factors. While these multiple factors are related, their individual impact on absorptive capacity has not been explored, nor is their relationship fully understood. The relationship among these factors should be studied further.

A second area of future research could take into consideration a different methodological perspective. This study was conducted using a qualitative

methodology that employed qualitative techniques to evaluate occurrences of repeated patterns, establish weighting scale from collected data, and calculate comparison. Some quantitative measured were also used to calculate three financial performance indicators—Total Asset Turnover, Total Account Receivable Turnover, and Gross Profit Margin. Future studies could be conducted using quantitative methodologies or mixed methodologies to test some emerged empirical evidence and to confirm the qualitative findings and proposed measures of this study.

A third possible area of future research could regard the implication of Thai IT SMEs context. This context has unique characteristics in that SMEs do not perform any novelty product development, performing only as a trader with implementation services. The selective decision to focus on this context may have introduced some specific characteristics critical to this context. This study could thus be extended to other non-Thai IT SMEs who perform the functions of distributor, value-added reseller or system integrators, considering the cultural aspects of the Thai context and could also be extended to other international contexts to confirm or disconfirm some of the emerged findings.

A final research possibility regards the recursive nature of absorptive capacity that, although not directly emerged from this study, could be further explored, as shown in a recent study of absorptive capacity meta-routines that described configuration cycles at the organizational level (Mariano & Al-Arrayed, 2017). This recursive nature is a first to its kind and provides a useful lens to further explorations of absorptive capacity from a multilevel perspective that could consider individuals (micro level), teams and departments (meso level), and the organization level (macro level).

5.8 Conclusion

The purpose of this research study was to explore how IT SMEs absorbed new knowledge; how absorptive meta-routines contributed to this absorption; and what exploratory regimes factors influenced knowledge absorption. The multiple case study method was employed and six IT SMEs were analyzed.

Findings revealed that absorptive capacity was crucial to these organizations, and that meta-routines and exploratory regimes were key to knowledge absorption (see also Senivongse et al., 2014). Some refinements to the original work developed by Lewin et al. (2011) were proposed, which included modifications to the sequence of meta-routines, the knowledge transfer boundaries, and the feedback loop. When exploring the contribution of exploratory regimes agent roles, behavioral factors, and impact factors appeared to have all an influence on knowledge absorption with some cultural sensitive factors that emerged as unique to Thai culture. Financial performance indicators showed that the effort in developing absorptive capacity was positively related to the firm's asset turnover, account receivable turnover, and gross profit margin for IT SMEs. This was a key contribution of this research study to existing literature.

BIBLIOGRAPHY

Abecassis-Moedas, C., & Mahmoud-Jouini, S. B. (2008). Absorptive capacity and source-recipient complementarity in designing new products: An empirically derived framework. *Journal of Product Innovation Management*, *25*, 473–490.

Adolphus, M. (2015). *How to conduct a systematic or evidence-based literature review Part: 1*, Retrieved from http://www.emeraldgrouppublishing.com/authors/guides/write/evidence_based.htm

Ali, S., Green, P., & Robb, A. (2012). Measuring Top Management's IT Governance Knowledge Absorptive Capacity. *Journal of Information Systems*, *27*(1), 137–155.

Alin, P., Taylor, J. E., & Smeds, R. (2011). Knowledge Transformation in Project Networks: A Speech Act Level Cross-Boundary Analysis. *Project Management Journal*, *42*(4), 58–75.

Alvesson, M., & Skoldberg, K. (2012). *Reflexive methodology: New vistas for qualitative research* (2nd. ed.). London: SAGE.

Ambrosini, V., & Bowman, C. (2003). How the resource-based and the dynamic capability views of the firm inform corporate-level strategy. *British Journal of Management*, *14*, 289–303.

Ambrosini, V., & Bowman, C. (2009). What are dynamic capabilities and are they a useful construct in strategic management ? *International Journal of Management Reviews*, *11*(1), 29–49.

Andersén, J. (2012). Protective capacity and absorptive capacity: Managing the balance between retention and creation of knowledge-based resources. *The Learning Organization*, *19*(5), 440–452.

Andersén, J., & Kask, J. (2012). Asymmetrically realized absorptive capacity and relationship durability. *Management Decision*, *50*(1), 43–57.

Barney, J. A., & Hansen, M. H. (1994). Trustworthiness as a source of competitive advantage. *Strategic Management Journal*, *15*(5), 175–190.

Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report Volume*, *13*(4), 544–559.

Beckett, R. C., & Hyland, P. (2011). Communication and learning structures that facilitate transfer of knowledge at innovation transition points. *Journal of Science Communication*, *10*(4).

Bennet, A., & Bennet, D. (2004). *Organizational Survival in the New World*. Burlington, MA: Routledge.

Bennet, A., & Bennet, D. (2008). The Decision-Making Process for Complex Situations in a Complex Environment. In *Handbook on Decision Support Systems* (CW (Eds), pp. 1–14).

Bennet, A., & Bennet, D. (2013). *Decision-Making in The New Reality Complexity, Knowledge, and Knowing*. Frost, WA: MQI Press.

Bennet, A., Bennet, D., & Avedisian, J. (2015). *The Course of Knowledge*. Frost, WA: MQI Press.

Bennet, D., & Bennet, A. (2008a). Associative Patterning: The Unconscious Life of an Organization. *Organizational Memory*, 1–28.

Bennet, D., & Bennet, A. (2008b). The depth of knowledge: surface, shallow or deep? *VINE*, *38*, 405–420.

Berghman, L., Matthyssens, P., Streukens, S., & Vandenbempt, K. (2013). Deliberate Learning Mechanisms for Stimulating Strategic Innovation Capacity. *Long Range Planning*, *46*(1–2), 39–71.

Biedenbach, T. (2009). The Power of Combinative Capabilities: Facilitating the Outcome of Frequent Innovation in Pharmaceutical R&D Projects. *Project Management Journal*, *42*(2), 63–80.

Boell, S. K., & Cecez-Kecmanovic, D. (2015). On being "systematic" in literature reviews in IS. *Journal of Information Technology*, *30*, 161–173.

Bonis, S., Taft, L., & Wendler, M. C. (2007). Strategies to Promote Success on the NCLEX-RN: An Evidence-Based Approach Using the Ace Star Model of Knowledge Transformation. *Nursing Education Perspectives*, *28*(2), 82–87.

Bontis, N. (2000). Managing An Organizational Learning System By Aligning Stocks And Flows Of Knowledge. *Journal of Management Studies*, *39*(4).

Boutros, T., & Purdie, T. (2014). *Process Improvement Handbook: A Blueprint for Managing Change and Increasing Organizational Performance*. New York, NY: McGraw-Hill Education.

Boyatzis, R. E. (1998). *Transforming Qualitative Information: Thematic analysis and code development* (1st ed.). Thousand Oak, CA: Sage.

Branzei, O., & Vertinsky, I. (2006). Strategic pathways to product innovation capabilities in SMEs. *Journal of Business Venturing*, *21*(1), 75–105.

Camisón, C., & Forés, B. (2011). Knowledge creation and absorptive capacity: The effect of intra-district shared competences. *Scandinavian Journal of Management*, *27*(1), 66–86.

Cantner, U., & Joel, K. (2011). Network position, absorptive capacity and firm success. *IUP Journal of Knowledge Management*, *9*(1), 57.

Caragliu, A., & Del Bo, C. (2011). Determinants of spatial knowledge spillovers in Italian provinces. *Socio-Economic Planning Sciences*, *45*(1), 28–37.

Carlile, P. R., & Rebentisch, E. S. (2003). Into the black box: The knowledge transformation cycle. *IEEE Engineering Management Review*, *31*(4), 67–80.

Carlo, J. L., Lyytinen, K., & Rose, G. M. (2012). A Knowledge-Based Model of Radical Innovation in Small Software Firms. *MIS Quarterly*, *36*(3), 865–895.

Carmeli, A., Brueller, D., & Dutton, J. E. (2008). Efetividade Do Processo De Comunicação Com Base Na Teoria Do Comportamento Informacional: O Caso De Um Organismo Internacional Da Área Da Saúde Pública Sediado No Brasil. *Systems Research and Behavioral Science*, *8*(3), 27–42.

Cauwelier, P., Ribière, V. M., & Bennet, A. (2016). Team psychological safety and team learning: a cultural perspective. *The Learning Organization*, *23*(6), 458–468.

Cepeda-Carrion, G., Cegarra-Navarro, J. G., & Jimenez-Jimenez, D. (2012). The effect of absorptive capacity on innovativeness: Context and information systems capability as catalysts. *British Journal of Management*, *23*(1), 110–129.

Chakravorti, S. (2011). Managing organizational culture change and knowledge to enhance customer experiences: analysis and framework. *Journal of Strategic Marketing*, *19*(2), 123–151.

Chang, Y., & Peng, M. W. (2012). Expatriate Knowledge Transfer, Subsidiary Absorptive Capacity, and Subsidiary Performance. *Academy of Management Journal*, *55*(4), 927–948.

Chen, Y. S., Lin, M. J. J., & Chang, C. H. (2009). The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets. *Industrial Marketing Management*, *38*(2), 152–158.

Cohen, W. M., & Levinthal, D. A. (1989). Innovation and Learning: The Two Faces of R & D. *The Economic Journal*, *99*(397), 569–596.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*, *35*(1), 128–152.

Collison, C., & Purcell, G. (2004). *Learning to Fly*. Capstone Publishing.

Cranefield, J., & Yoong, P. (2007). The role of the Translator/Interpreter in Knowledge Transfer Environment. *Knowledge and Process Management*, *14*(2), 95–103.

Creswell, J. W. (2013). *Qualitative Inquiry & Research Design*. Thousand Oaks, CA: SAGE.

Creswell, J. W. (2014). *Research Design* (4th ed.). Thousand Oaks, CA: SAGE.

Crossan, M. M., Lane, H. W., & White, R. E. (1999). An Organizational Learning

Framework: From Intuition to Institution. *Academy of Management Review*, 24 (3), 522-537.

Crotty, M. (1998). *The Foundations of Social Research*. Thousand Oaks, CA: SAGE.

Culpan, R. (2008). The role of strategic alliances in gaining sustainable competitive advantage for firms. *Management Revue*, *19*, 94–105.

Daspit, J. J., & Souza, D. E. D. (2013). Understanding the Multi-Dimensional Nature of Absorptive Capacity. *Journal of Managerial Issues*, *XXV*(3), 299–316.

De Boer, M., Van Den Bosch, F. A. J., & Volberda, H. W. (1999). Managing Organizational Knowledge Integration in the Emerging Multimedia Complex. *Journal of Management Studies*, *36*(May), 379–398.

Denford, J. S. (2013). Building knowledge : developing a knowledge-based dynamic capabilities typology. *Journal of Knowledge Management*, *17*(2), 175–194.

Denzin, N. K. (2009). The elephant in the living room: or extending the conversation about the politics of evidence. *Qualitative Research*, *9*(2), 139–160.

Descotes, R. M., & Walliser, B. (2013). Foreign market-related knowledge absorption and the international financial performance of SMEs. *International Management*, *17*(4), 178–193.

Desouza, K. C., & Paquette, S. (2011). *Knowledge Management: An Introduction*. New York, NY: Neal-Schuman.

Dibbern, B. J., Winkler, J., & Heinzl, A. (2008). Explaining Variations in client Extra Costs Between Software Projects Offshored to India. *MIS Quarterly*, *32*(2), 333–366.

Easterby-smith, M., Lyles, M. A., Peteraf, M. A., Gebauer, H., Worch, H., & Truffer, B. (2008). Dynamic Capabilities : Current Debates and Future Directions. *British Journal of Management*, *30*, 57–73.

EBSCO. (2015). About EBSCO | EBSCO Information Services. Retrieved April 8, 2015, from https://www.ebsco.com/about/who-we-are

Edmondson, A. (1999). Psychological Safety and Learning Behavior in Work Teams. *Administrative Science Quarterly*, *44*(2), 350.

Edmondson, A. (2014). Psychological Safety , Trust , and Learning in Organizations : A Group-level Lens, (December), 1–43.

Eisenhardt, K. M. K. M., & Martin, J. A. J. A. (2000). Dynamic capabilities: what are they? *Strategic Management Journal*, *21*, 1105–1121.

Elbashir, M. Z., Collier, P. a., & Sutton, S. G. (2011). The role of organizational absorptive capacity in strategic use of business intelligence to support integrated management control systems. *Accounting Review*, *86*(1), 155–184.

Elwyn, G., Taubert, M., & Kowalczuk, J. (2007). Sticky knowledge: a possible model for investigating implementation in healthcare contexts. *Implementation Science: IS*, *2*, 44.

Enkel, E., & Heil, S. (2014). Preparing for distant collaboration: Antecedents to potential absorptive capacity in cross-industry innovation. *Technovation*, *34*(4), 242–260.

Ernst, D., & Kim, L. (2002). Global production networks, knowledge diffusion, and local capability formation. *Research Policy*, *31*, 1417–1429.

Feldman, M. S., & Pentland, B. T. (2003). Reconceptualizing Organizational Routines as a Source of Flexibility and Change. *Administrative Science Quarterly*, *48*(1), 94.

Fernhaber, S. A., & Patel, P. C. P. C. (2012). How do Young Firms Manage Product Portfolio Complexity? The Role of Absorptive Capacity and Ambidexterity. *Strategic Management Journal*, *33*, 1516–1539.

Fiegen, A. M. (2010). Systematic review of research methods : the case of business instruction. *Reference Services Review*, *38*(3), 385–397.

Flanagan, J. C. (1954). The Critical Incident Technique. *Psychological Bulletin*, *51*(4), 327–358.

Flatten, T. C., Engelen, A., Zahra, S. A., & Brettel, M. (2011). A measure of absorptive capacity: Scale development and validation. *European Management Journal*, *29*(2), 98–116.

Fosfuri, A., & Tribó, J. a. (2008). Exploring the antecedents of potential absorptive capacity and its impact on innovation performance. *The International Journal of Management Science*, *36*(2), 173–187.

Garner, B. K. (2007). *Getting to "Got It!": Helping Struggling Students Learn How to Learn*. Alexandria, VA: Association for Supervision and Curriculum Development.

Gastaldi, L., Lettieri, E., Corso, M., & Masella, C. (2012). Performance improvement in hospitals: leveraging on knowledge asset dynamics through the introduction of an electronic medical record. *Measuring Business Excellence*, *16*(4), 14–30.

Gebauer, H., Worch, H., & Truffer, B. (2012). Absorptive capacity , learning

processes and combinative capabilities as determinants of strategic innovation. *European Management Journal*, *30*(1), 57–73.

Ghauri, P. N., & Park, B. Il. (2012). The Impact of Turbulent Events on Knowledge Acquisition: Comparison of Cross-border Acquisitions Formed Before and After the Crisis. *Management International Review*, *52*(2), 293–315.

Grant, R. M. (1996). Prospering in Dynamically-Competitive Environments: Organizational Capability as Knowledge Integration. *Organization Science*, *7*(4), 375–387.

Greve, H. R. (2008). Organizational Routines and Performance Feedback. *Handbook of Organizational Routines*, 187–204.

Helfat, C. E., Finkelstein, S., Mitchell, W., Peteraf, M. A., Singh, H., Teece, D. J., & Winter, S. G. (2007). Dynamic capabilities: Understanding strategic change in organizations. Strategic Management Journal (Vol. 18), 147.

Helfat, C. E., & Peteraf, M. A. (2009). Understanding dynamic capabilities: progress along a developmental path. *Strategic Organization*, *7*, 91–102.

Hemingway, P., & Bereton, N. (2009, April). What is a systematic review? *Evidence-Based Medicine*, (May-June 2006), 1–8.

Henard, D. H., & Mcfadyen, M. A. (2006). R & D Knowledge is power. *Industrial Research Institute Inc*, 46–54.

Hughes, H. (2007). Critical Incident Technique. *Exploring Methods in Information Literacy Research*, 49–66.

Inkpen, A. C., & Beamish, P. W. (1997). Knowlegde, bargaining power, and the

instability of international joint ventures. *Academy of Management Review*, *22*(1), 177–202.

Jackson, N. (2008). *Systematic reviews of health promotion and public health interventions*. *Cochrane Collaboration Health Promotion and Public Health Field*, 9. Retrieved from http://ph.cochrane.org/sites/ph.cochrane.org/files /uploads/HPPH_systematic_review_handbook.pdf

Jansen, J. J. P., van den Bosch, F. a J., & Volberda, H. W. (2005). Managing Potential and Realised Absorptive Capacity: How do Organisational Antecedents Matter? *Academy of Management*, *48*(6), 16.

Joglar, H., & Chaparro, J. (2007). Valuing IS / IT Resources as an Antecedent of Absorptive Capacity: An RBV Perspective IS / IT Resources from an RBV Perspective. *Information Science and Information Technology*, *4*, 445–459.

Joglekar, P., Bohl, A. H., & Hamburg, M. (1997). Comments on Fortune Favors the Prepared Firm. *Management Science*, *43*(10), 1455–1462.

Jones, C., & Hecker, R. (2003). e-Extinction: An Illusion of Knowledge, the Presence of Ignorance, or Evolutionary Fate. *Journal of Enterprising Culture*, *11*(4), 359–378.

Kalling, T. (2003). Organization-internal transfer of knowledge and the role of motivation: a qualitative case study. *Knowledge and Process Management*, *10*(2), 115.

Katz, R., & Allen, T. (1982). Investigating the Not Invented Here syndrom e: a look at the perform ance, tenure and com m unification patterns of 50 R& D project groups. *R&D Management*, *12*(1956), 7–19.

Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the Royal Society of Medicine*, *96*(3), 118–21.

Khoja, F., & Maranville, S. (2009). The power of intrafirm networks. *Academy of Strategic Management Journal*, *8*, 51–70.

Khoja, F., & Maranville, S. (2010). How Do Firms Nurture Absorptive Capacity? *Journal of Managerial Issues*, *22*(2), 262–278.

Kim, W. C., & Mauborgne, R. (2004). Blue ocean strategy. *Harvard Business Review*, *82*, 76–84, 156.

Kogut, B., & Zander, U. (1992). Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science*, *3*(3), 383–397.

Koruna, S. M. (2003). Leveraging knowledge assets: combinative capabilities - theory and practice. *R&D Management*, *34*(5).

Koskinen, K. U. (2012). Knowledge integration in systems integrator type project-based companies: a systemic view. *International Journal of Managing Projects in Business*, *5*(2), 285–299.

Kostopoulos, K., Papalexandris, A., Papachroni, M., & Ioannou, G. (2011). Absorptive capacity, innovation, and financial performance. *Journal of Business Research*, *64*(12), 1335–1343.

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The Reification of Absorptive Capacity: A Critical Review and Rejuvenation of the Construct. *Academy of Management Review*, 31, 833-863.

Lane, P. J., & Lubatkin, M. (1998). Relative absorptive capacity and interorganization

learning. *Strategic Management Journal*, *19*(5), 461–477.

Lane, P. J., Salk, J. E., & Lyles, M. a. (2001). Absorptive capacity, learning, and performance in international joint ventures. *Strategic Management Journal*, *22*(12), 1139–1161.

Law, K. K. (2013). The problem with knowledge ambiguity. *European Management Journal*, *32*(3), 444–450.

Lazaric, N., Longhi, C., & Thomas, C. (2008). Gatekeepers of Knowledge versus Platforms of Knowledge: From Potential to Realized Absorptive Capacity. *Regional Studies*, *42*(6), 837–852.

Lee, J., Hyejung, L., & Jun-Gi, P. (2014). Exploring the impact of empowering leadership on knowledge sharing, absorptive capacity and team performance in IT service. *Information Technology & People*, *27*(3), 366–386.

Lee, S. C., Liang, H., & Liu, C. Y. (2010). The effects of absorptive capacity, knowledge sourcing strategy, and alliance forms on firm performance. *The Service Industries Journal*, *30*(14), 2421–2440.

Lewin, A. Y., Massini, S., & Peeters, C. (2011). Microfoundations of Internal and External Absorptive Capacity Routines. *Organization Science*, *22*(1), 81–98.

Li, Y., Lee, S. H., Li, X., & Liu, Y. (2010). Knowledge codification, exploitation, and innovation: The moderating influence of organizational controls in Chinese firms. *Management and Organization Review*, *6*(2), 219–241.

Li, Y., Li, X., Liu, Y., & Barnes, B. R. (2011). Knowledge communication, exploitation and endogenous innovation: The moderating effects of internal controls in SMEs. *R&D Management*, *41*(2), 156–172.

Lichtenthaler, U. (2005). External commercialization of knowledge: Review and research agenda. *International Journal of Management Reviews*, *7*(4), 231–255.

Lichtenthaler, U. (2008). Relative capacity: Retaining knowledge outside a firm's boundaries. *Journal of Engineering and Technology Management*, *25*(3), 200–212.

Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence, and the complementarity of organizational learning processes. *Academy of Management Journal*, *52*, 822–846.

Lichtenthaler, U., & Ernst, H. (2006). Attitudes to externally organising knowledge management tasks: A review, reconsideration and extension of the NIH syndrome. *R&D Management*, *36*(4), 367–386.

Lichtenthaler, U., & Ernst, H. (2009). The role of champions in the external commercialization of knowledge. *Journal of Product Innovation Management*, *26*(4), 371–387.

Lichtenthaler, U., & Lichtenthaler, E. (2009). A capability-based framework for open innovation: Complementing absorptive capacity. *Journal of Management Studies*, *46*(8), 1315–1338.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic Inquiry*. Newsbury Park, CA: SAGE.

Liu, W. (2006). Knowledge Exploitation, Knowledge Exploration, and Competency Trap. *Knowledge and Process Management*, *13*(3), 144–161.

Lu, I. Y., Su, T. H., & Huang, I. C. (2010). Consulting knowledge and organisation's absorptive capacity: A communication chain perspective. *The Service Industries*

Journal, *30*(12), 2007–2022.

Macpherson, A., & Holt, R. (2007). Knowledge, learning and small firm growth: A systematic review of the evidence. *Research Policy*, *36*(2), 172–192.

Madhok, A., & Liu, C. (2006). A coevolutionary theory of the multinational firm. *Journal of International Management*, *12*(1), 1–21.

Malhotra, A., Gosain, S., & Sawy, O. a El. (2005). Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation. *MIS Quarterly*, *29*(1), 145–187.

March, J. G. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science*, *2*, 71–87.

Mariano, S., & Al-Arrayed, S. (2016). Combinations of absorptive capacity metaroutines: The role of organizational disruptions and time constraints. *European Management Journal*, 1–12.

Mariano, S., & Casey, A. (2015). Is organizational innovation always a good thing? *Management Learning*, *46*(5), 530–545.

Mariano, S., & Walter, C. (2015). Article information : The Construct of Absorptive Capacity in Knowledge Management and Intellectual Capital Research: Content and Text Analyses. *Journal of Knowledge Management*, *19*(2), 372–400.

Maxwell, J. A. (2013). *Qualitative Research Design: An Interactive Approach* (3rd ed.). New York: SAGE.

Melkas, H., Uotila, T., & Kallio, A. (2010). Information quality and absorptive capacity in service and product innovation processes. *Interdisciplinary Journal*

of Information, Knowledge, and Management, *5*, 357–374.

Merok Paulsen, J., & Brynjulf Hjertø, K. (2014). Exploring individual-level and group-level levers for inter-organizational knowledge transfer. *The Learning Organization*, *21*(4), 274–287.

Ministry of Industry of Industry of Thailand. (2002). *SME Definition by Ministry of Industry of Thailand. Bangkok*. Retrieved from www.sme.go.th

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). *Prefered Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement*. Retrieved from http://www.prisma-statement.org.

Mowery, D. C., Oxley, J. E., & Silverman, B. S. (1996). Strategic alliance and interfirm knowledge transfer. *Strategic Management Journal*, *17*(1996), 77–91.

Murray, J. Y., & Chao, M. C. H. (2005). A Cross-Team Framework of International Knowledge Acquisition on New Product Development Capabilities and New Product Market Performance. *Journal of International Marketing*, *13*(3), 54–78.

Mursitama, T. N. (2011). Searching for potential and realized absorptive capacity of the firm: The case of japanese joint ventures in Indonesia. *The IUP Journal of Knowledge Management*, *9*(4), 53–75.

Nagati, H., & Rebolledo, C. (2012). The role of relative absorptive capacity in improving suppliers' operational performance. *International Journal of Operation & Production Management*, *32*(5), 611–630.

Nair, S. (2011). *What do we do now? The Role of Absorptive Capacity and Consulting Service Firms in the Internalization of New Knowledge Within Organizations*. Doctoral Dissertation, University of Massachusetts Amherst.

Nelson, R. R., & Winter, S. G. (2009). *An Evolutionary Theory of Economic Change*. Massachusett, MA: Harvard University.

Nonaka, I., Hirose, A., & Takeda, Y. (2016). "Meso"-Foundations of Dynamic Capabilities: Team-Level Synthesis and Distributed Leadership as the Source of Dynamic Creativity. *Global Strategy Journal*, *6*(3), 168–182.

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge Creating Company*. New York, NY: Oxford University.

O'Reilly, C. A., & Tushman, M. L. (2007). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, *28*(1963), 185–206.

OECD. (2013). *OECD Reviews of Innovation Policy Innovation in Southeast Asia*.

Office of Small and Medium Enterprise Promotion. (2007). *The 2nd SMEs Promotion Plan 2007-2011*. Retrieved from http://eng.sme.go.th/SiteCollectionDocuments/ SMEs Promotion Plan/SME-Master-Plan-2.pdf

Office of Small and Medium Enterprise Promotion. (2012a). *Part 1 Situation and Economic Indicators of SMEs in 2011 and 2012*. Retrieved from http://www.sme.go.th/SiteCollectionDocuments/White Paper/2554-new/Eng_01.pdf

Office of Small and Medium Enterprise Promotion. (2012b). Part 2 Situation and Structual Indicators of SMEs. Retrieved December 15, 2014, from http://www.sme.go.th/SiteCollectionDocuments/White Paper/2554-new/Eng_02.pdf

Pablos, P. O. De. (2006). Transnational corporations and strategic challenges: An

analysis of knowledge flows and competitive advantage. *The Learning Organization*, *13*(6), 544–559.

Park, B. Il. (2011). Differences in knowledge acquisition mechanisms between IJVs with Western vs Japanese parents Focus on factors comprising absorptive capacity. *Management Decision*, *40*(3), 422–443.

Parmigiani, A., & Howard-Grenville, J. (2011). Routines Revisited: Exploring the Capabilities and Practice Perspectives. *The Academy of Management Annals*, *5*(1), 413–453.

Pavlou, P. A., & El Sawy, O. A. (2006). Decomposing and leveraging dynamic capabilities. *Anderson Graduate School of Management, University of California, Riverside, CA*, *17*(3), 198–227.

Peeters, C., Massini, S., & Lewin, A. Y. (2014). Sources of Variation in the Efficiency of Adopting Management Innovation: The Role of Absorptive Capacity Routines, Managerial Attention and Organizational Legitimacy. *Organization Studies*, *35*(9), 1343–1371.

Penghu, L., & Xiaojin, L. (2014). The study of service enterprise knowledge search absorption effect on product innovation performance after service failure. *Journal of Chemical and Pharmaceutical Research*, *6*(3), 424–429.

Peteraf, M., Di Stefano, G., & Verona, G. (2013). The Elephant in the room of dynamic capabilities. *Strategic Management JournalManagement Journal*, *34*, 1389–1410.

Piaget, J. (1952). The origins of intelligence in children. *Journal of Consulting Psychology*, *17*, 467–467.

Popaitoon, S., & Siengthai, S. (2014). The moderating effect of human resource management practices on the relationship between knowledge absorptive capacity and project performance in project-oriented companies. *International Journal of Project Management*, *32*(6), 908–920.

Pratt, M. G., Rockmann, K. W., & Kaufmann, J. B. (2006). Constructing Professional Identity: The Role of Work and Identity Learning Cycles in the Customization of Identity Among Medical Residents. *Academy of Management Journal*, *49*(2), 235–262.

Raisch, S., & Birkinshaw, J. (2008). Organizational Ambidexterity: Antecedents, Outcomes, and Moderators. *Journal of Management*, *34*(3), 375–409.

Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research. *MIS Quarterly*, *36*(2), 625-A6.

Robertson, P. L., Casali, G. L., & Jacobson, D. (2012). Managing open incremental process innovation: Absorptive Capacity and distributed learning. *Research Policy*, *41*(5), 822–832.

Rosenkopf, L., & Nerkar, A. (2001). Beyond local search: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, *22*(4), 287–306.

Rothaermel, F. T., & Alexandre, M. T. (2009). Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity. *Organization Science*, *20*(4), 759–780.

Roxas, B. (2008). Social Capital for Knowledge Management: the Case of Small and

Medium-Sized Enterprises in the Asia-Pacific Region. *Asian Academy of Management Journal*, *13*(2), 57–77.

Royal Thai Government. Computer Crimes ACT B.E. 2007 (2007). Bangkok.

Salvato, C., & Rerup, C. (2011). Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities. *Journal of Management*, *37*(2), 468–490.

Schmidt, T. (2010). Absorptive Capacity-One Size Fits All? A Firm-Level Analysis of Absorptive Capacity for Different Kind of Knowledge. *Managerial and Decision Economics*, *31*, 1–18.

Senge, P. M. (2006). *The fifth discipline: The art and practice of the learning organization*. Broadway Business.

Senivongse, C., Bennet, A., & Mariano, S. (2017). Utilizing a systematic literature review to develop an integrated framework for information and knowledge management systems. *VINE Journal of Information and Knowledge Management Systems*, *47*(2), 250–264.

Senivongse, C., Mariano, S., & Bennet, A. (2014). Internal processes of absorptive capacity: A systematic literature review and future research directions. In *ICICKM 2015* (pp. 1–12). Sonning Common, England: ACPI.

Serenko, A., & Bontis, N. (2009). Global ranking of knowledge management and intellectual capital academic journals. *Journal of Knowledge Management*, *13*(1), 4–15.

Shafique, M. (2013). Thinking Inside the Box? Intellectual Structure of the Knowledge Base of Innovation Research (1988–2008). *Strategic Management*

Journal, *34*, 62–93.

Sherif, K., Munasinghe, M., & Sharma, C. (2012). The combinative effect of electronic open networks and closed interpersonal networks on knowledge creation in academic communities. *Vine*, *42*(2), 277–294.

Sheu, M. Z., & Wong, W.-C. (2006). A Knowledge Assimilation Schema for Acquiring Technical Knowledge. *Journal of Information Systems Education*, *17*(2), 223.

Stake, R. E. (1995). *The art of case study research*. Thousand Oak, CA, CA: SAGE.

Sun, P. Y. T., & Anderson, M. H. (2010). An examination of the relationship between absorptive capacity and organizational learning, and a proposed integration. *International Journal of Management Reviews*, *12*(2), 130–150.

Szulanski, G. (1996). Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm. *Strategic Management Journal*, *17*, 27–43.

Tang, F. (2011). Knowledge Transfer in Intra-Organization Networks. *Systems Research and Behavioral Science*, *28*, 270–282.

Tavani, S. N., Sharifi, H., Soleimanof, S., & Najmi, M. (2013). An empirical study of firm's absorptive capacity dimensions, supplier involvement and new product development performance. *International Journal of Production Research*, *51*(11), 3385–3403.

Techatassanasoontorn, A. a., Tapia, A. H., & Powell, A. (2010). Learning processes in municipal broadband projects: An absorptive capacity perspective. *Telecommunications Policy*, *34*(10), 572–595.

Teece, D. J. (2007). Explicating Dynamic Capabilitites: The Nature and Microfoundations of (Sustainable) Enterprise Performance. *Strategic Management Journal*, *1350*(August), 1319–1350.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, *18*(7), 509–533.

Thomas, G. (2011). *How to do Your Case Study: A Guide for Students & Researchers*. Thousand Oaks, CA: SAGE.

Tiwana, A., & McLean, E. (2005). Expertise Integration and Creativity in Information Systems Development. *Journal of Management Information Systems*, *22*(1), 13–43.

Todorova, G., & Durisin, B. (2007). Absorptive Capacity: Valuing a Reconceptualization. *Academy of Management Review*, *32*(3), 774–786.

Tortoriello, M. (2006). *The Social Underpinnings of A bsorptive Capacity: External Knowledge, Social networks, and Individual Innovativeness*. Carnegie Mellon University.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business-unit innovation and performance. *Academy of Management Journal*, *44*(5), 996–1004.

Tzabbar, D., Aharonson, B. S., & Amburgey, T. L. (2013). When does tapping external sources of knowledge result in knowledge integration? *Research Policy*, *42*(2), 481–494.

Van den Bosch, F. A. J., Volberda, H. W., & de Boer, M. (1999). Coevolution of Firm Absorptive Capacity and Knowledge Environment: Organizational Forms

and Combinative Capabilities. *Organization Science*, *10*(5), 551–568.

Vega-jurado, J., Gutiérrez-Gracia, A., & Fernández-de-Lucio, I. (2008). Analyzing the determinants of firm's absorptive capacity: beyond. *R&D Management*, *38*(4), 392–405.

Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. *International Journal of Management Reviews*, *9*(1), 31–51.

Wang, Y.-L., Wang, Y.-D., & Horng, R.-Y. (2009). Learning and innovation in small and medium enterprises. *Industrial Management & Data Systems*, *110*(2), 175–192.

Webster, J., & Watson, R. T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, *26*(2), xiii–xxiii.

Weitzman, E. A. (2005). *Software And Qualitative Research* (2nd ed.). Thousand Oaks, CA: SAGE.

Wiley Online. (n.d.). *Strategic Management Journal - Wiley Online Library*. Retrieved from http:// http://onlinelibrary.wiley.com/.

William J. Wales, Parida, V., & Patel, P. C. (2013). Too much of a good thing? absorptive capacity, firm performance, and the moderating role of entrepreneurial orientation. *Strategic Management Journal*, *1173*(February), 12.

Yeoh, P.-L. (2008). Realized and Potential Absorptive Capacity: Understanding Their Antecedents and Performance in the Sourcing Context. *The Journal of Marketing Theory and Practice*, *17*(1), 21–36.

Yin, R. K. (2011). *Qualitative Research from Start to Finish*. New York, NY: The

Guilford Press.

Yin, R. K. (2014). *Case Study Research Design and Methods* (5th editio). SAGE.

Yli-Renko, H., Autio, E., & Sapienza, H. J. (2001). Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal*, *22*(6–7), 587–613.

Zahra, S. A., & George, G. (2002). Absorptive Capacity: A Review, Reconceptualization, and Extension. *Academy of Management Proceedings & Membership Directory*, *27*(2), 185–203.

Zahra, S. A., & Hayton, J. C. (2008). The effect of international venturing on firm performance: The moderating influence of absorptive capacity. *Journal of Business Venturing*, *23*(2), 195–220.

Zollo, M., & Winter, S. G. (2002). Deliberate Learning and the Evolution of Dynamic Capabilities. *Organization Science*, *13*, 339–351.

Zott, C. (2003). Dynamic capabilities and the emergence of intraindustry differential firm performance: Insights from a simulation study. *Strategic Management Journal*, *24*(2), 97–125.

APPENDIX

APPENDIX 1: List of Questions Used as Guideline for the Case Study Interviews

(Please note that this is the complete list of questions used in the pilot interview. It was significantly refined and reduced in the following stages of data collection)

Identifying and recognizing value of externally generated knowledge	
Actor Roles	• Who screen for new technology? • Who performs the decision on exploring the new technology?
Behavioral Factors	• What inspires you to decide to grab new technology into the company?
Impact Factors	• What triggers the decision to decide to take new technology and opportunities for the company?
Process and Routines	• What is your screening process to select or to drop?
Learning from and with partners, suppliers, customers, and consultants	
Actor Roles	• When dealing with external parties, do language become the barriers in communicating with partners/suppliers?
Behavioral Factors	• How do you create trust or strengthen network relationship with partners/suppliers?
Impact Factors	• If you decide you want a new knowledge but you have low competency in such area, what would you do to make decision?
Process and Routines	• How initial idea get reviewed? • How do you communicate and share with key team members?

Transferring knowledge back to the organization	
Actor Roles	• How do you overcome language and knowledge transfer barriers?
Behavioral Factors	• Do you have problem convincing the team to adopt new knowledge? • How do you motivate the team that the new knowledge is good?
Impact Factors	• If you don't have enough knowledge about the new technology, how do you get the message across to convince your team?
Process and Routines	• Do you communicate the voice of customers, the markets, and the sales to the team?
Facilitating variation	
Actor Roles	• Do you develop internal competency to lead the communication to get knowledge across?
Behavioral Factors	• How do you deal with resistant when facilitating the new knowledge sharing?
Impact Factors	• Do you evaluate risk of grabbing new knowledge? • How do you plan on educating your staffs who don't have the knowledge on new technology?
Process and Routines	• Do you involve external suppliers/partners in communicating with your team about the new knowledge?
Internal selection regimes	
Actor Roles	• How the change agent (the new technology champion) influence the applying of new knowledge to current work?
Behavioral Factors	• Is there any resistance for integrating new knowledge to existing work?
Impact Factors	• Do you experience not enough knowledge to integrate new knowledge to the current work?
Process and Routines	• Do you have steps in performing the integration of new knowledge into the existing line of work?

Sharing knowledge and superior practices across the organization	
Actor Roles	• Do you feel you don't have enough power, authority to perform new knowledge integration?
Behavioral Factors	• Do management keep track and support on the testing and applying of new knowledge?
Impact Factors	• Do you have organizational change to undertake the implementation of new knowledge?
Process and Routines	• How do you keep track of new implementation and process change?
Reflecting, updating, and replicating	
Actor Roles	• How the new field of knowledge be tested?
Behavioral Factors	• How do you prevent your new competency from being copied by your competitor?
Impact Factors	• How do you measure the result?
Process and Routines	• Do you do benchmarking with others outside your organization about the new change?
Managing adaptive tension	
Actor Roles	• Do you have dedicated function to track the impact of your deployment of new knowledge?
Behavioral Factors	• How do you ensure the quality be sustained?
Impact Factors	• What measuring factors are you using to track the result?
Process and Routines	• Do you have routines on collecting data and evidence on the result of implementation?

APPENDIX 2: List of 189 of the Constructed Referential Space for Systematic Literature Review

Abecassis-Moedas, C., & Mahmoud-Jouini, S. B. (2008). Absorptive capacity and source-recipient complementarity in designing new products: An empirically derived framework. *Journal of Product Innovation Management*, *25*, 473–490.

Ali, S., Green, P., & Robb, A. (2012). Measuring Top Management's IT Governance Knowledge Absorptive Capacity. *Journal of Information Systems*, *27*(1), 137–155.

Alin, P., Taylor, J. E., & Smeds, R. (2011). Knowlede Transformation in Project Networks: A Speech Act Level Cross-Boundary Analysis. *Project Management Journal*, *42*(4), 58–75.

Andersén, J. (2012). Protective capacity and absorptive capacity: Managing the balance between retention and creation of knowledge-based resources. *The Learning Organization*, *19*(5), 440–452.

Andersén, J., & Kask, J. (2012). Asymmetrically realized absorptive capacity and relationship durability. *Management Decision*, *50*(1), 43–57.

Awang, A. H., Hussain, M. Y., & Malek, J. A. (2013). Knowledge transfer and the role of local absorptive capability at science and technology parks. *Learning Organization, The*, *20*(4), 291–307.

Beckett, R. C., & Hyland, P. (2011). Communication and learning structures that facilitate transfer of knowledge at innovation transition points. *Journal of Science Communication*, *10*(4).

Berghman, L., Matthyssens, P., Streukens, S., & Vandenbempt, K. (2013). Deliberate Learning Mechanisms for Stimulating Strategic Innovation Capacity. *Long Range Planning*, *46*(1–2), 39–71.

Bertrand, O., & Mol, M. J. (2013). The Antecedents and Innovation Effects of Domestic and Offshore R&D Outsourcing: The Contingent Impact of Cognitive Distance and Absorptive Capacity. *Strategic Management Journal*, *34*, 751–760.

Biedenbach, T. (2009). The Power of Combinative Capabilities: Facilitating the Outcome of Frequent Innovation in Pharmaceutical R&D Projects. *Project Management Journal*, *42*(2), 63–80.

Birkinshaw, J. M., Hamel, G., & Mol, M. (2009). Management innovation. *Academy of Management Review*, *33*(4), 825–845.

Bledow, R., Frese, M., Anderson, N., Erez, M., & Farr, J. (2009). A Dialectic Perspective on Innovation: Conflicting Demands, Multiple Pathways, and Ambidexterity. *Industrial and Organizational Psychology*, *2*(3), 305–337.

Bonis, S., Taft, L., & Wendler, M. C. (2007). Strategies to Promote Success on the NCLEX-RN: An Evidence-Based Approach Using the Ace Star Model of Knowledge Transformation. *Nursing Education Perspectives*, *28*(2), 82–87.

Boynton, A C., Zmud, R. W., & Jacobs, G. C. (1994). The influence of IT management practice on IT use in large organizations. *Management Practice and IT Use*, *18*(3), 299–309.

Branzei, O., & Vertinsky, I. (2006). Strategic pathways to product innovation capabilities in SMEs. *Journal of Business Venturing*, *21*(1), 75–105.

Britton, J. N. H. (2004). High technology localization and extra-regional networks. *Entrepreneurship & Regional Development*, *16*(5), 369–390.

Camisón, C., & Forés, B. (2011). Knowledge creation and absorptive capacity: The effect of intra-district shared competences. *Scandinavian Journal of Management*, *27*(1), 66–86.

Cantner, U., & Joel, K. (2011). Network position, absorptive capacity and firm success. *IUP Journal of Knowledge Management*, *9*(1), 57.

Caragliu, A., & Del Bo, C. (2011). Determinants of spatial knowledge spillovers in Italian provinces. *Socio-Economic Planning Sciences*, *45*(1), 28–37.

Carlile, P. R., & Rebentisch, E. S. (2003). Into the black box: The knowledge transformation cycle. *IEEE Engineering Management Review*, *31*(4), 67–80.

Carlo, J. L., Lyytinen, K., & Rose, G. M. (2012). A Knowledge-Based Model of Radical Innovation in Small Software Firms. *MIS Quarterly*, *36*(3), 865–895.

Castro, J. M. de, Diniz, D. M., Duarte, R. G., & Dressler, M. (2013). Fatores determinantes em processos de transferência de conhecimentos : um estudo de caso na Embrapa Milho e Sorgo e. *Revista Brasileira de Administração Pública*, *47*(5), 1283–1306.

Ceccagnoli, M., & Jiang, L. (2013). The Cost of integrating External Technologies: Supply and Demand Drivers of Value Creation in the Markets for Technology. *Strategic Management Journal*, *34*, 404–425.

Cepeda-Carrion, G., Cegarra-Navarro, J. G., & Jimenez-Jimenez, D. (2012). The effect of absorptive capacity on innovativeness: Context and

information systems capability as catalysts. *British Journal of Management*, *23*(1), 110–129.

Chakravorti, S. (2011). Managing organizational culture change and knowledge to enhance customer experiences: analysis and framework. *Journal of Strategic Marketing*, *19*(2), 123–151.

Chang, Y., & Peng, M. W. (2012). Expatriate Knowledge Transfer, Subsidiary Absorptive Capacity, and Subsidiary Performance. *Academy of Management Journal*, *55*(4), 927–948.

Charue-Duboc, F. (2006). A Theoretical Framework for Understanding the Organisation of the R&D Function: an Empirical Illustration From the Chemical and Pharmaceutical Industry. *International Journal of Innovation Management*, *10*(4), 455–476.

Chen, Y. S., Lin, M. J. J., & Chang, C. H. (2009). The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets. *Industrial Marketing Management*, *38*(2), 152–158.

Christopher, M., & Gaudenzi, B. (2009). Exploiting knowledge across networks through reputation management. *Industrial Marketing Management*, *38*(2), 191–197.

Chua, A. Y. K., & Heng, S. K. (2010). A knowledge management perspective on Art Education. *International Journal of Information Management*, *30*(4), 326–334.

Colakoglu, S., Yamao, S., & Lepak, D. P. (2014). Knowledge creation capability in MNC subsidiaries: Examining the roles of global and local knowledge inflows and subsidiary knowledge stocks. *International Business Review*, *23*(1), 91–101.

Contractor, F. J., & Ra, W. (2002). How knowledge attributes influence alliance governance choices: A theory development note. *Journal of International Management*, *8*(1), 11–27.

Cordingley, P. (2008). Research and evidence-informed practice: focusing on practice and practitioners. *Cambridge Journal of Education*, *38*(1), 37–52.

Cranefield, J., & Yoong, P. (2007). The role of the Translator/Interpreter in Knowledge Transfer Environment. *Knowledge and Process Management*, *14*(2), 95–103.

Culpan, R. (2008). The role of strategic alliances in gaining sustainable competitive advantage for firms. *Management Revue*, *19*, 94–105.

Daspit, J. J., & Souza, D. E. D. (2013). Understanding the Multi-Dimensional Nature of Absorptive Capacity ^. *Journal of Managerial Issues*, *XXV*(3), 299–316.

De Boer, M., Van Den Bosch, F. A. J., & Volberda, H. W. (1999). Managing Organizational Knowledge Integration in the Emerging Multimedia Complex. *Journal of Management Studies*, *36*(May), 379–398.

Descotes, R. M., & Walliser, B. (2011). Foreign market-related knowledge absorption and the international financial performance of SMEs. *International Management*.

Desouza, K. C., Awazu, Y., & Tiwana, A. (2006). Four Dynamics for Bringing Use Back Into Software Reuse. *Communication of the ACM*, *49*(1), 97–100.

Dibbern, B. J., Winkler, J., & Heinzl, A. (2008). Explaining Variations in client Extra Costs Between Software Projects Offshored to India. *MIS Quarterly*, *32*(2), 333–366.

Dutta, D. K. (2012). Inter-Organizational Relationships and Firm Performance: Impact of Complementary Knowledge and Relative Absorptive Capacity. *Journal of Management Policy and Practice*, *13*(2), 46–56.

Elbashir, M. Z., Collier, P. a., & Sutton, S. G. (2011). The role of organizational absorptive capacity in strategic use of business intelligence to support integrated management control systems. *Accounting Review*, *86*(1), 155–184.

Elwyn, G., Taubert, M., & Kowalczuk, J. (2007). Sticky knowledge: a possible model for investigating implementation in healthcare contexts. *Implementation Science: IS*, *2*, 44.

Enkel, E., & Heil, S. (2014). Preparing for distant collaboration: Antecedents to potential absorptive capacity in cross-industry innovation. *Technovation*, *34*(4), 242–260.

Ernst, D., & Kim, L. (2002). Global production networks, knowledge diffusion, and local capability formation. *Research Policy*, *31*, 1417–1429.

Falvey, R., Foster, N., & Greenaway, D. (2007). Relative backwardness, absorptive capacity and knowledge spillovers. *Economics Letters*, *97*(3), 230–234.

Ferdows, K. (2006). Transfer of changing production know-how. *Production and Operations Management*, *15*(1), 1–9.

Fernhaber, S. A., & Patel, P. C. P. C. (2012). How do Young Firms Manage Product Portfolio Complexity? The Role of Absorptive Capacity and Ambidexterity. *Strategic Management Journal*, *33*, 1516–1539.

Flatten, T. C., Engelen, A., Zahra, S. A., & Brettel, M. (2011). A measure of absorptive capacity: Scale development and validation. *European Management Journal*, *29*(2), 98–116.

Fosfuri, A., & Tribó, J. a. (2008). Exploring the antecedents of potential absorptive capacity and its impact on innovation performance. *The International Journal of Management Science*, *36*(2), 173–187.

Gann, D. (2001). Putting academic ideas into practice: technological progress and the absorptive capacity of construction organizations. *Construction Management and Economics*, *19*(3), 321–330.

García-Morales, V. J., Lloréns-Montes, F. J., & Verdú-Jover, A. J. (2008). The effects of transformational leadership on organizational performance through knowledge and innovation. *British Journal of Management*, *19*(4), 299–319.

Gastaldi, L., Lettieri, E., Corso, M., & Masella, C. (2012). Performance improvement in hospitals: leveraging on knowledge asset dynamics through the introduction of an electronic medical record. *Measuring Business Excellence*, *16*(4), 14–30.

Gebauer, H., Worch, H., & Truffer, B. (2012). Absorptive capacity , learning processes and combinative capabilities as determinants of strategic innovation. *European Management Journal*, *30*(1), 57–73.

Geisler, E. (2010). Measuring the Contributions of Knowledge Management Systems to the Strategic Competitiveness of Organizations: a Review and a Model. *International Journal of Innovation and Technology Management*, *7*(2), 89–107.

Ghauri, P. N., & Park, B. Il. (2012). The Impact of Turbulent Events on Knowledge Acquisition: Comparison of Cross-border Acquisitions Formed Before and After the Crisis. *Management International Review*, *52*(2), 293–315.

Gressgård, L. J. (2011). Virtual team collaboration and innovation in organizations. *Team Performance Management*, *17*(1/2), 102–119.

Guo, B., & Guo, J.-J. (2011). Patterns of technological learning within the knowledge systems of industrial clusters in emerging economies: Evidence from China. *Technovation*, *31*(2–3), 87–104.

Gurrieri, A. R. (2008). Knowledge network dissemination in a family-firm sector. *Journal of Socio-Economics*, *37*(6), 2380–2389.

Gutiérrez, L. J. G., Bustinza, O. F., & Molina, V. B. (2012). Six sigma, absorptive capacity and organisational learning orientation. *International Journal of Production Research*, *50*(3), 661–675.

Hakanen, T. (2014). Co-creating integrated solutions within business networks: The KAM team as knowledge integrator. *Industrial Marketing Management*, *43*(7), 1195–1203.

Henard, D. H., & Mcfadyen, M. A. (2006). R & D Knowledge is power. *Industrial Research Institute Inc*, 46–54.

Henard, D. H., & Mcfadyen, M. A. (2008). Making Knowledge Workers More Creative.

Hong, J.-C., Hwang, M.-Y., & Lin, C.-L. (2003). Chi and Organizational Creativity: A Case Study of Three Taiwanese Computer Firms. *Journal Compilation, Blackwell Publishing*, *12*(Number 4), 202–210.

Jalonen, H., & Lönnqvist, A. (2009). Predictive business – fresh initiative or old wine in a new bottle. *Management Decision*, *47*(10), 1595–1609.

Jansen, J. J. P., van den Bosch, F. a J., & Volberda, H. W. (2005). Managing Potential and Realised Absorptive Capacity: How do Organisational Antecedents Matter? *Academy of Management*, *48*(6), 16.

Joglar, H., & Chaparro, J. (2007). Valuing IS / IT Resources as an Antecedent of Absorptive Capacity: An RBV Perspective IS / IT Resources from an RBV Perspective. *Information Science and Information Technology*, *4*, 445–459.

Joglekar, P., Bohl, A. H., & Hamburg, M. (1997). Comments on Fortune Favors the Prepared Firm. *Management Science*, *43*(10), 1455–1462.

Jones, C., & Hecker, R. (2003). e-Extinction: An Illusion of Knowledge, the Presence of Ignorance, or Evolutionary Fate. *Journal of Enterprising Culture*, *11*(4), 359–378.

Kalling, T. (2003). Organization-internal transfer of knowledge and the role of motivation: a qualitative case study. *Knowledge and Process Management*, *10*(2), 115.

Khoja, F., & Maranville, S. (2009). The power of intrafirm networks. *Academy of Strategic Management Journal*, *8*, 51–70.

Khoja, F., & Maranville, S. (2010). How Do Firms Nurture Absorptive Capacity? *Journal of Managerial Issues*, *22*(2), 262–278.

Kim, K. Y., & Kim, Y. S. (2011). Causal design knowledge: Alternative representation method for product development knowledge management. *CAD Computer Aided Design*, *43*(9), 1137–1153.

Knott, A. M. (2008). R&D/Returns Causality: Absorptive Capacity or Organizational IQ. *Management Science*, *54*(12), 2054–2067.

Kogut, B., & Zander, U. (1992). Knowledge of the Firm, Combinative Capabilities, and the Replication of Technology. *Organization Science*, *3*(3), 383–397.

Koruna, S. M. (2003). Leveraging knowledge assets: combinative capabilities - theory and practice. *R&D Management*, *34*(5).

Koskinen, K. U. (2012). Knowledge integration in systems integrator type project-based companies: a systemic view. *International Journal of Managing Projects in Business*, *5*(2), 285–299.

Kwok, S. H., & Gao, S. (2005). Attitude Towards Knowledge Sharing Behavior. *Journal of Computer Information Systems*, *46*(2), 45–51.

Lane, P. J., Koka, B. R., & Pathak, S. (2006). The Reification of Absorptive Capacity: A Critical Review and Rejuvenation of the Construct. *Academy of Management Review*.

Lane, P. J., & Lubatkin, M. (1998). Relative absorptive capacity and interorganization learning. *Strategic Management Journal*, *19*(5), 461–477.

Lane, P. J., Salk, J. E., & Lyles, M. a. (2001). Absorptive capacity, learning, and performance in international joint ventures. *Strategic Management Journal*, *22*(12), 1139–1161.

Law, K. K. (2013). The problem with knowledge ambiguity. *European Management Journal*, *32*(3), 444–450.

Lawson, B., & Potter, A. (2012). Determinants of knowledge transfer in inter-firm new product development projects. *International Journal of Operations & Production Management*, *32*(10), 1228–1247.

Lazaric, N., Longhi, C., & Thomas, C. (2008). Gatekeepers of Knowledge versus Platforms of Knowledge: From Potential to Realized Absorptive Capacity. *Regional Studies*, *42*(6), 837–852.

Lee, J., Hyejung, L., & Jun-Gi, P. (2014). Exploring the impact of empowering leadership on knowledge sharing, absorptive capacity and team performance in IT service. *Information Technology & People*, *27*(3), 366–386.

Lee, W.-L., Chiang, J.-C., Wu, Y.-H., & Liu, C.-H. (2012). How knowledge exploration distance influences the quality of innovation. *Total Quality Management & Business Excellence*, *23*(9), 1–15.

Lewin, A. Y., Massini, S., & Peeters, C. (2011). Microfoundations of Internal and External Absorptive Capacity Routines. *Organization Science*, *22*(1), 81–98.

Li, J., & Kozhikode, R. K. (2008). Knowledge management and innovation strategy: The challenge for latecomers in emerging economies. *Asia Pacific Journal of Management*, *25*(3), 429–450.

Li, S.-T., & Chang, W.-C. (2009). Exploiting and transferring presentational knowledge assets in R&D organizations. *Expert Systems with Applications*, *36*(1), 766–777.

Li, Y., Lee, S. H., Li, X., & Liu, Y. (2010). Knowledge codification, exploitation, and innovation: The moderating influence of organizational controls in Chinese firms. *Management and Organization Review*, *6*(2), 219–241.

Li, Y., Li, X., Liu, Y., & Barnes, B. R. (2011). Knowledge communication, exploitation and endogenous innovation: The moderating effects of internal controls in SMEs. *R&D Management*, *41*(2), 156–172.

Lichtenthaler, U. (2005). External commercialization of knowledge: Review and research agenda. *International Journal of Management Reviews*, *7*(4), 231–255.

Lichtenthaler, U. (2007). Hierarchical strategies and strategic fit in the keep-or-sell decision. *Management Decision*, *45*(3), 340–359.

Lichtenthaler, U. (2008). Relative capacity: Retaining knowledge outside a firm's boundaries. *Journal of Engineering and Technology Management*, *25*(3), 200–212.

Lichtenthaler, U. (2009). Absorptive capacity, environmental turbulence, and the complementarity of organizational learning processes. *Academy of Management Journal*, *52*, 822–846.

Lichtenthaler, U., & Ernst, H. (2006). Attitudes to externally organising knowledge management tasks: A review, reconsideration and extension of the NIH syndrome. *R&D Management*, *36*(4), 367–386.

Lichtenthaler, U., & Ernst, H. (2007). Developing reputation to overcome the imperfections in the markets for knowledge. *Research Policy*, *36*(1), 37–55.

Lichtenthaler, U., & Ernst, H. (2009). The role of champions in the external commercialization of knowledge. *Journal of Product Innovation Management*, *26*(4), 371–387.

Lichtenthaler, U., & Lichtenthaler, E. (2009). A capability-based framework for open innovation: Complementing absorptive capacity. *Journal of Management Studies*, *46*(8), 1315–1338.

Lin, C., Tan, B., & Chang, S. (2002). The critical factors for technology absorptive capacity. *Industrial Management & Data Systems*, *102*(6), 300–308.

Lin, Y.-T., & Jou, M. (2013). Development of an Integrated Learning Environment with Knowledge Management for Cultivating Student Critical Thinking Skills. *Procedia - Social and Behavioral Sciences*, *103*, 290–298.

Liu, W. (2006). Knowledge Exploitation, Knowledge Exploration, and Competency Trap. *Knowledge and Process Management*, *13*(3), 144–161.

Lu, I.-Y., Su, T.-H., & Huang, I.-C. (2010). Consulting knowledge and organisation's absorptive capacity: A communication chain perspective. *The Service Industries Journal*, *30*(12), 2007–2022.

Macpherson, A., & Holt, R. (2007). Knowledge, learning and small firm growth: A systematic review of the evidence. *Research Policy*, *36*(2), 172–192.

Madhok, A., & Liu, C. (2006). A coevolutionary theory of the multinational firm. *Journal of International Management*, *12*(1), 1–21.

Madnick, S., Wang, R., & Xiang, X. (2003). The Design and Implementation of a Corporate Householding Knowledge Processor to Improve Data Quality. *Journal of Management Information Systems*, *20*(3), 41–69.

Maiga, A. S., Nilsson, A., & Jacobs, F. a. (2013). Extent of managerial IT use, learning routines, and firm performance: A structural equation modeling of their relationship. *International Journal of Accounting Information Systems*, *14*(4), 297–320.

Makri, M., Hitt, M. A., & Lane, P. J. (2010). Complementary Technologies, Knowledge Relatedness, and Invention Outcomes in High Technology Mergers and Acquisitions. *Strategic Management Journal*, *31*, 602–628.

Malhotra, A., Gosain, S., & Sawy, O. a El. (2005). Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation. *MIS Quarterly*, *29*(1), 145–187.

Marcus, T., & Shoham, S. (2014). Knowledge assimilation by employees in learning organizations. *The Learning Organization*, *21*(6), 350–368.

Mariano, S., & Casey, A. (2015). Is organizational innovation always a good thing? *Management Learning*.

Mariano, S., & Walter, C. (2015). Article information : The Construct of Absorptive Capacity in Knowledge Management and Intellectual Capital Research: Content and Text Analyses. *Journal of Knowledge Management*, *19*(2).

Martinez-Noya, A., Garcia-Canal, E., & Guillen, M. F. (2013). R&D Outsourcing and the Effectiveness of Intangible Investments: Is Proprietary Core Knowledge Walking out of the Door? *Journal of Management Studies*, *50*(1), 67–91.

Maynez-Guaderrama, A. I., & Cavazos-Arroya, J. (2012). La influencia de la cultura Organizacional Y La Capacidad De Absorción Sobre La Transferencia De Conocimiento Tácito Intra-Organizacional. *Estudios Gerenciales*, *28*, 191–211.

McNamara, P., & Baden-Fuller, C. (1999). Lessons from the Celltech Case: Balancing Knowledge Exploration and Exploitation in Organizational Renewal. *British Journal of Management*, *10*(4), 291–307.

Melkas, H., Uotila, T., & Kallio, A. (2010). Information quality and absorptive capacity in service and product innovation processes. *Interdisciplinary Journal of Information, Knowledge, and Management*, *5*, 357–374.

Merok Paulsen, J., & Brynjulf Hjertø, K. (2014). Exploring individual-level and group-level levers for inter-organizational knowledge transfer. *The Learning Organization*, *21*(4), 274–287.

Meyer, J. P. (2011). Effects of Exploration on the Relationship Between Intellectual Capital and the Retained Technical Value of Innovation. *International Journal of Innovation Management*, *15*(2), 249–277.

Minbaeva, D. B. (2005). HRM practices and MNC knowledge transfer. *Personnel Review*, *34*(1), 125–144.

Mom, T. J. M., van den Bosch, F. a. J., & Volberda, H. W. (2009). Understanding Variation in Managers' Ambidexterity: Investigating Direct and Interaction Effects of Formal Structural and Personal Coordination Mechanisms. *Organization Science*, *20*(4), 812–828.

Moos, B., Beimborn, D., Wagner, H.-T., & Weitzel, T. I. M. (2013). the Role of Knowledge Management Systems for Innovation: an Absorptive Capacity Perspective. *International Journal of Innovation Management*, *17*(5), 1.

Mowery, D. C., Oxley, J. E., & Silverman, B. S. (1996). Strategic alliance and interfirm knowledge transfer. *Strategic Management Journal*, *17*(1996), 77–91.

Murray, J. Y., & Chao, M. C. H. (2005). A Cross-Team Framework of International Knowledge Acquisition on New Product Development Capabilities and New Product Market Performance. *Journal of International Marketing*, *13*(3), 54–78.

Mursitama, T. N. (2011). Searching for potential and realized absorptive capacity of the firm: The case of Japanese joint ventures in Indonesia. *The IUP Journal of Knowledge Management*, *9*(4), 53–75.

Nagati, H., & Rebolledo, C. (2012). The role of relative absorptive capacity in improving suppliers' operational performance. *International Journal of Operation & Production Management*, *32*(5), 611–630.

Nair, S. (2011). *What do we do now? The Role of Absorptive Capacity and Consulting Service Firms in the Internalization of New Knowledge Within Organizations*. University of Massachusetts Amherst.

Negassi, S. (2004). R&D co-operation and innovation a microeconometric study on French firms. *Research Policy*, *33*(3), 365–384.

Newell, S., Huang, J. C., Galliers, R. D., & Pan, S. L. (2003). Implementing enterprise resource planning and knowledge management systems in tandem: Fostering efficiency and innovation complementarity. *Information and Organization*, *13*(1), 25–52.

Nooteboom, B. (2000). Learning by interaction: Absorptive capacity, cognitive distance and governance. *Journal of Management and Governance*, *4*(1–2), 69–92.

Pablos, P. O. De. (2006). Transnational corporations and strategic challenges: An analysis of knowledge flows and competitive advantage. *The Learning Organization*, *13*(6), 544–559.

Pacheco-de-Almeida, G., & Zemsky, P. (2007). The Timing of Resource Development and Sustainable Competitive Advantage. *Management Science*, *53*(4), 651–666.

Pak, Y. S., Ra, W., & Lee, J. M. (2014). An integrated multi-stage model of knowledge management in international joint ventures: Identifying a trigger for knowledge exploration and knowledge harvest. *Journal of World Business*, *50*(1), 180–191.

Park, B. I. (2011). Knowledge transfer capacity of multinational enterprises and technology acquisition in international joint ventures. *International Business Review*, *20*(1), 75–87.

Park, T. (2012). Antecedents of knowledge competency and performance in born globals: The moderating effects of absorptive capacity. *Management Decision*, *50*(8), 1361–1381.

Park, B. Il. (2011). Differences in knowledge acquisition mechanisms between IJVs with Western vs Japanese parents Focus on factors comprising absorptive capacity. *Management Decision*, *40*(3), 422–443.

Parmigiani, A., & Howard-Grenville, J. (2011). Routines Revisited: Exploring the Capabilities and Practice Perspectives. *The Academy of Management Annals*, *5*(1), 413–453.

Patel, P. C., & Fiet, J. O. (2011). Knowledge combination and the potential advantages of family firms in searching for opportunities. *Entrepreneurship: Theory and Practice*, *35*(6), 1179–1197.

Pavlou, P. A., & El Sawy, O. A. (2006). Decomposing and leveraging dynamic capabilities. *Anderson Graduate School of Management, University of California, Riverside, CA*, *17*(3), 198–227.

Peeters, C., Massini, S., & Lewin, A. Y. (2014). Sources of Variation in the Efficiency of Adopting Management Innovation: The Role of Absorptive Capacity Routines, Managerial Attention and Organizational Legitimacy. *Organization Studies*, *35*(9), 1343–1371.

Penghu, L., & Xiaojin, L. (2014). The study of service enterprise knowledge search absorption effect on product innovation performance after service failure. *Journal of Chemical and Pharmaceutical Research*, *6*(3), 424–429.

Phelps, R., Adams, R. J., & Bessant, J. (2007). Life cycles of growing organizations: A review with implications for knowledge and learning. *International Journal of Management Reviews*, *9*(1), 1–30.

Popaitoon, S., & Siengthai, S. (2014). The moderating effect of human resource management practices on the relationship between knowledge absorptive capacity and project performance in project-oriented companies. *International Journal of Project Management*, *32*(6), 908–920.

Quéré, M. (2008). Innovation Networks in the Life Sciences Industry: A Discussion of the French Genopoles Policy. *European Planning Studies*, *16*(3), 411–427.

Reagans, R., & McEvily, B. (2002). Network Structure and Knowledge Transfer: The Effects of Cohesion and Range. *Administrative Science Quarterly*, *48*(2000), 240–267.

Robbins, S. (2004). IS Governance. *Information Systems Management*, *21*(4), 81–82.

Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive Capacity and Information Systems Research: Review, Synthesis, and Directions for Future Research. *MIS Quarterly*, *36*(2), 625-A6.

Robertson, P. L., Casali, G. L., & Jacobson, D. (2012). Managing open incremental process innovation: Absorptive Capacity and distributed learning. *Research Policy*, *41*(5), 822–832.

Robinson, S., & Stubberud, H. A. (2011). Sources of Information and Cooperation for Innovation in Norway. *Journal of International Business Research*, *10*(2), 91–102.

Rose-anderssen, C., Baldwin, J. S., Ridgway, K., Allen, P. M., & Varga, L. (2009). Knowledge Transformation, Learning and Changes Giving Competitive Advantage... *E:CO*, *11*(2), 15–29.

Rosenkopf, L., & Nerkar, A. (2001). Beyond local search: Boundary-spanning, exploration, and impact in the optical disk industry. *Strategic Management Journal*, *22*(4), 287–306.

Roxas, B. (2008). Social Capital for Knowledge Management: the Case of Small and Medium-Sized Enterprises in the Asia-Pacific Region. *Asian Academy of Management Journal*, *13*(2), 57–77.

Saito, H., & Gopinath, M. (2011). Knowledge spillovers, absorptive capacity, and skill intensity of chilean manufacturing plants. *Journal of Regional Science*, *51*(1), 83–101.

Salvato, C., & Rerup, C. (2011). Beyond Collective Entities: Multilevel Research on Organizational Routines and Capabilities. *Journal of Management*, *37*(2), 468–490.

Sarkar, M. B., Aulakh, P. S., & Madhok, A. (2009). Process Capabilities and Value Generation in Alliance Portfolios. *Organization Science*, *20*(3), 583–600.

Schildt, H., Keil, T., & Maula, M. (2012). The Temporal Effects of relative and Firm-Level Absorptive Capacity on Interorganizational Learning. *Strategic Management Journal*, *33*, 1154–1173.

Schmidt, T. (2010). Absorptive Capacity-One Size Fits All? A Firm-Level Analysis of Absorptive Capacity for Different Kind of Knowledge. *Managerial and Decision Economics*, *31*, 1–18.

Shafique, M. (2013). Thinking Inside the Box? Intellectual Structure of the Knowledge Base of Innovation Research (1988–2008). *Strategic Management Journal*, *34*, 62–93.

Shang, S. S. C., Li, E. Y., Wu, Y. L., & Hou, O. C. L. (2011). Understanding Web 2.0 service models: A knowledge-creating perspective. *Information and Management*, *48*(4–5), 178–184. Retrieved from http://dx.doi.org/10.1016/j.im.2011.01.005

Shepherd, M., Abidi, S. S. R., Qigang, G., Zhixin, C., Qiufen, Q., & Finley, G. A. (2006). Information Systems and Health Care Ix: Accessing Tacit Knowledge and Linking It To the Peer-Reviewed Literature. *Communications of AIS*, *2006*(17), 2–39.

Sherif, K., Munasinghe, M., & Sharma, C. (2012). The combinative effect of electronic open networks and closed interpersonal networks on knowledge creation in academic communities. *Vine*, *42*(2), 277–294.

Sheu, M. Z., & Wong, W.-C. (2006). A Knowledge Assimilation Schema for Acquiring Technical Knowledge. *Journal of Information Systems Education*, *17*(2), 223.

Sie, L., & Yakhlef, A. (2013). The Passion for Knowledge: Implications for its Transfer. *Knowledge and Process Management*, *20*(1), 12–20.

Sun, P. Y. T., & Anderson, M. H. (2010). An examination of the relationship between absorptive capacity and organizational learning, and a proposed integration. *International Journal of Management Reviews*, *12*(2), 130–150.

Szulanski, G. (1996). Exploring Internal Stickiness: Impediments to the Transfer of Best Practice Within the Firm. *Strategic Management Journal*, *17*, 27–43.

Tang, F. (2011). Knowledge Transfer in Intra-Organization Networks. *Systems Research and Behavioral Science*, *28*, 270–282.

Tavani, S. N., Sharifi, H., Soleimanof, S., & Najmi, M. (2013). An empirical study of firm's absorptive capacity dimensions, supplier involvement and new product development performance. *International Journal of Production Research*, *51*(11), 3385–3403.

Techatassanasoontorn, A. a., Tapia, A. H., & Powell, A. (2010). Learning processes in municipal broadband projects: An absorptive capacity perspective. *Telecommunications Policy*, *34*(10), 572–595.

Tiwana, A., & McLean, E. (2005). Expertise Integration and Creativity in Information Systems Development. *Journal of Management Information Systems*, *22*(1), 13–43.

Todorova, G., & Durisin, B. (2003). The concept and the reconceptualization of absorptive capacity: recognizing the value. *Working Paper N. 95/03*, (September), SDA – Bocconi Research Division.

Trieschmann, J. S., & Dennis, A. R. (2000). Serving Multiple Constituencies in the Business School: MBA Program vs. Research Performance Serving Multiple Constituencies in the Business School, *Academy of Management Journal*, *43*(6), 1130–1141.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: Effects of network position and absorptive capacity on business-unit innovation and performance. *Academy of Management Journal*, *44*(5), 996–1004.

Tseng, C.-Y., Pai, D. C., & Hung, C.-H. (2011). Knowledge absorptive capacity and innovation performance in KIBS. *Journal of Knowledge Management*, *15*(6), 971–983.

Tuggle, F. D., & Goldfinger, W. E. (2004). A methodology for mining embedded knowledge from process maps. *Human Systems Management*, *23*, 1–13.

Tzabbar, D., Aharonson, B. S., & Amburgey, T. L. (2013). When does tapping external sources of knowledge result in knowledge integration? *Research Policy*, *42*(2), 481–494.

Van den Bosch, F. A. J., Volberda, H. W., & de Boer, M. (1999). Coevolution of Firm Absorptive Capacity and Knowledge Environment: Organizational Forms and Combinative Capabilities. *Organization Science*, *10*(5), 551–568.

Vega-Jurado, J., Fernández-De-Lucio, I., & Huanca, R. (2008). University-industry relations in Bolivia: Implications for university transformations in Latin America. *Higher Education*, *56*(2), 205–220. http://doi.org/10.1007/s10734-007-9098-9

Vega-jurado, J., Gutiérrez-Gracia, A., & Fernández-de-Lucio, I. (2008). Analyzing the determinants of firm's absorptive capacity: beyond. *R&D Management*, *38*(4), 392–405.

Vega-Jurado, J., Gutiérrez-Gracia, A., Fernández-de-Lucio, I., & Manjarrés-Henríquez, L. (2008). The effect of external and internal factors on firms' product innovation. *Research Policy*, *37*(4), 616–632.

Verbeke, A., Bachor, V., & Nguyen, B. (2013). Procedural Justice, Not Absorptive Capacity, Matters in Multinational Enterprise ICT Transfers. *Management International Review*, *53*(4), 535–554.

Verhagen, W. J. C., Garcia, P. B., Mariot, P., Cotton, J.-P., Ruiz, D., Redon, R., & Curran, R. (2012). Knowledge-based cost modelling of composite

wing structures. *International Journal of Computer Integrated Manufacturing*, *25*(4–5), 368–383.

Wang, C. L., & Ahmed, P. K. (2007). Dynamic capabilities: A review and research agenda. *International Journal of Management Reviews*, *9*(1), 31–51.

Wang, E. T. G., Chia-Lin Lin, C., Jiang, J. J., & Klein, G. (2007). Improving enterprise resource planning (ERP) fit to organizational process through knowledge transfer. *International Journal of Information Management*, *27*(3), 200–212.

Wang, Y.-L., Wang, Y.-D., & Horng, R.-Y. (2009). Learning and innovation in small and medium enterprises. *Industrial Management & Data Systems*, *110*(2), 175–192.

Xu, Q., & Ma, Q. (2008). Determinants of ERP implementation knowledge transfer. *Information and Management*, *45*(8), 528–539.

Yeoh, P.-L. (2008). Realized and Potential Absorptive Capacity: Understanding Their Antecedents and Performance in the Sourcing Context. *The Journal of Marketing Theory and Practice*, *17*(1), 21–36.

Yli-Renko, H., Autio, E., & Sapienza, H. J. (2001). Social capital, knowledge acquisition, and knowledge exploitation in young technology-based firms. *Strategic Management Journal*, *22*(6–7), 587–613.

Yordanova, D., Ivanov, V., Barzev, K., Kolev, I., Mitev, G., & Bratanov, D. (2009). Encouragement of the Relationships Science - Business Through Establishment of Centers for Technology Transfer in Bulgaria (the Case of the University of Rousse). *European Integration Studies*, (3), 23–29.

Zhao, X. J., & Anand, J. (2009). A Multilevel Perspective on Knowledge Transfer: Evidence from the Chinese Automotive Industry. *Strategic Management Journal*, *30*, 959–983.

Zott, C. (2003). Dynamic capabilities and the emergence of intraindustry differential firm performance: Insights from a simulation study. *Strategic Management Journal*, *24*(2), 97–125.

APPENDIX 3: Data Collection Authorization Letters

Dear Khun Soonthorn,

Thank you for opening up your company to allow me to collect data for my Bangkok University's Ph.D. research study. This is to summarize the details that we had on the phone with Thai translation at the bottom of this message.

My research study is about the company's ability to absorb of new knowledge from external sources and see how it's transformed and make use of it throughout the organization. I will focus my study on 4 factors.

1. Human factor from the decision point to adopt new knowledge and their roles and responsibility to help get the knowledge across the organization.
2. Behavioral factor of how incentives or cultures have on the absorption of new knowledge into the company.
3. Managerial and Leadership factor of how leadership support and encourage the absorption, as well as the adjustment of organization structure and resources to support the new absorption.
4. Process and Procedure of how the flow of works impact the absorption of new knowledge

The discussion topic will be on 2 cases, a successful and a failure of absorption, during the past recent years.

I wish to conduct interviews around those 2 cases with the 4 factors, starting with you, and I hope you could refer me to other 4 staffs of yours from various departments, e.g. engineering, sales, HR, etc., that involves with such adoption of new knowledge cases.

The interview will be around 1 hour for each person. I wish to also request for your permission to record our conversation session. The interview will be conducted in Thai. During the data collection session, I may ask for evidence that support the discussion.

The study is entirely for academic purpose only. I ensure that your business credential and your name will not be release to public.

Best Regards,

Chulatep Senivongse

----Thai Translation below----

เรียนคุณสุนทรครับ

ขอบคุณมากที่ให้โอกาศผมได้เข้าไปเก็บข้อมูลสำหรับการทำวิจัยระดับปริญญาเอกของมหาวิทยาลัยกรุงเทพ สำหรับรายละเอียดตามที่ได้คุยกันทางโทรศัพท์นั้นสรุปได้ดังนี้ครับ

งานวิจัยของผมเกี่ยวข้องกับความสามารถขององค์กรในการรับความรู้ใหม่ๆแล้วนำมาปรับใช้เพื่อเพิ่มขีดความสามารถในการแข่งขัน ในงานศึกษาของผมนั้นผมจะเน้นอยู่ที่องค์ประกอบสี่ตัวดังนี้

1. **ปัจจัย ของบุคคล ผมจะดูบทบาทของคนที่เกี่ยวข้องตั้งแต่เริ่มตัดสินใจที่จะเลือกเอาความรู้ ใหม่เข้ามาใช้ในองค์กรและการเผยแพร่ความรู้ใหม่นั้นไปยังบุคคลอื่นหรือหน่วย งานอื่น**
2. **ปัยจัยที่มีผลกระทบกับพฤติกรรมเช่น รางวัล ความสนิทสนม ความไว้เนื้อเชื่อใจเป็นต้น**
3. **ปัจจัยด้านองค์กรและการจัดการ เช่น ผู้นำ การปรับองค์กร นโยบายต่างๆ**
4. **กระบวนการการนำความรู้ใหม่เข้าสู่องกรณ์และการประยุกต์ใช้**

การเก็บข้อมูลจะเน้นที่การนำเอาความรู้ใหม่เข้ามาและประยุกต์ใช้ทั้งที่ประสพความสำเร็จหนึ่กรณี และที่ไม่ประสพความสำเร็จอีกหนึ่งกรณี

ในการสัมภาษณ์จะเป็นภาษาไทยโดยจะเป็นการสอบถามถึงกรณีทั้งสองโดยมีมุมมองตามปัจจัยทั้งสี่ โดยการสัมภาษณ์จะใช้เวลาประมาณ 1 ชั่วโมงต่อท่าน ทั้งนี้ต้องรบกวนขอรายชื่อทีมงานที่เกี่ยวข้องด้วยอีก 4 ท่านโดยทั้ง 4 ควรจะมาจากหน่วยงานที่แตกต่างกันเช่น หน่วยงานวิศวกรรม หน่วยงานขาย หน่วยงานบุคคล เป็นต้น

ในการสัมภาษณ์ผมอยากจะขออนุญาตบันทึกการสนทนาด้วย ขณะเดียวกันผมอาจจะขอหลักฐานที่เกี่ยวข้อง (ถ้ามี) ด้วยนะครับ

การเก็บข้อมูลนี้มีวัตถุประสงค์เพื่อการศึกษาเท่านั้น ชื่อของบริษัทและบุคคลจะถือเป็นความลับและจะไม่แสดงต่อสาธารณะเป็นอันขาด

ด้วยความนับถือ

จุลเทพ เสนีวงศ์ ณ อยุธยา

Dear Khun Jutipat,

Thank you for opening up your company to allow me to collect data for my Bangkok University's Ph.D. research study. This is to summarize the details that we had on the phone with Thai translation at the bottom of this message.

My research study is about the company's ability to absorb of new knowledge from external sources and see how it's transformed and make use of it throughout the organization. I will focus my study on 4 factors.

1. Human factor from the decision point to adopt new knowledge and their roles and responsibility to help get the knowledge across the organization.
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The discussion topic will be on 2 cases, a successful and a failure of absorption, during the past recent years.

I wish to conduct interviews around those 2 cases with the 4 factors, starting with you, and I hope you could refer me up to other 15 staffs of yours from various departments, e.g. engineering, sales, marketing, HR, procurement, etc., that involves with such adoption of new knowledge cases.

The interview will be around 1 hour for each person. I wish to also request for your permission to record our conversation session. The interview will be conducted in Thai. During the data collection session, I may ask for evidence that support the discussion.

The study is entirely for academic purpose only. I ensure that your business credential and your name will not be release to public.

Best Regards,

Chulatep Senivongse

----Thai Translation below----

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2. **ปัยจัยที่มีผลกระทบกับพฤติกรรมเช่น รางวัล ความสนิทสนม ความไว้เนื้อเชื่อใจ เป็นต้น**
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4. **กระบวนการการนำความรู้ใหม่เข้าสู่องค์กรและการประยุกต์ใช้**

การเก็บข้อมูลจะเน้นที่การนำเอาความรู้ใหม่เข้ามาและประยุกต์ใช้ทั้งที่ประสพความสำเร็จหนึ่งกรณี และที่ไม่ประสพความสำเร็จอีกหนึ่งกรณี

ในการสัมภาษณ์จะเป็นภาษาไทยโดยจะเป็นการสอบถามถึงกรณีทั้งสองโดยมีมุมมองตามปัจจัยทั้งสี่ โดยการสัมภาษณ์จะใช้เวลาประมาณ 1 ชั่วโมงต่อท่าน ทั้งนี้ต้องรบกวนขอรายชื่อทีมงานที่เกี่ยวข้องด้วยอีกประมาณ 15 ท่านโดยทั้ง 15 ท่านควรจะมาจากหน่วยงานที่แตกต่างกันเช่น หน่วยงานวิศวกรรม หน่วยงานขาย หน่วยงานการตลาด หน่วยงานจัดซื้อ หน่วยงานบุคคล เป็นต้น

ในการสัมภาษณ์ผมอยากจะขออนุญาตบันทึกการสนทนาด้วย ขณะเดียวกันผมอาจจะขอหลักฐานที่เกี่ยวข้อง (ถ้ามี) ด้วยนะครับ

การเก็บข้อมูลนี้มีวัตถุประสงค์เพื่อการศึกษาเท่านั้น ชื่อของบริษัทและบุคคลจะถือเป็นความลับและจะไม่แสดงต่อสาธารณะเป็นอันขาด

ด้วยความนับถือ

จุลเทพ เสนีวงศ์ ณ อยุธยา

Dear Khun Lerchai,

Thank you for opening up your company to allow me to collect data for my Bangkok University's Ph.D. research study. This is to summarize the details that we had on the phone with Thai translation at the bottom of this message.

My research study is about the company's ability to absorb of new knowledge from external sources and see how it's transformed and make use of it throughout the organization. I will focus my study on 4 factors.

1. Human factor from the decision point to adopt new knowledge and their roles and responsibility to help get the knowledge across the organization.
2. Behavioral factor of how incentives or cultures have on the absorption of new knowledge into the company.
3. Managerial and Leadership factor of how leadership support and encourage the absorption, as well as the adjustment of organization structure and resources to support the new absorption.
4. Process and Procedure of how the flow of works impact the absorption of new knowledge

The discussion topic will be on 2 cases, a successful and a failure of absorption, during the past recent years.

I wish to conduct interviews around those 2 cases with the 4 factors, starting with you, and I hope you could refer me to other 4 staffs of yours from various departments, e.g. engineering, sales, HR, etc., that involves with such adoption of new knowledge cases.

The interview will be around 1 hour for each person. I wish to also request for your permission to record our conversation session. The interview will be conducted in Thai. During the data collection session, I may ask for evidence that support the discussion.

The study is entirely for academic purpose only. I ensure that your business credential and your name will not be release to public.

Best Regards,

Chulatep Senivongse

----Thai Translation below----

เรียนคุณลือชัยครับ

ขอบคุณมากที่ให้โอกาศผมได้เข้าไปเก็บข้อมูลสำหรับการทำวิจัยระดับปริญญาเอกของมหาวิทยาลัยกรุงเทพ สำหรับรายละเอียดตามที่ได้คุยกันทางโทรศัพท์นั้นสรุปได้ดังนี้ครับ

งานวิจัยของผมเกี่ยวข้องกับความสามารถขององค์กรในการรับความรู้ใหม่ๆแล้วนำมาปรับใช้เพื่อเพิ่มขีดความสามารถในการแข่งขัน ในงานศึกษาของผมนั้นผมจะเน้นอยู่ที่องค์ประกอบสี่ตัวดังนี้

1. **ปัจจัย ทางด้านบุคคล ผมจะดูบทบาทของคนที่เกี่ยวข้องตั้งแต่เริ่มตัดสินใจที่จะเลือกเอาความรู้ ใหม่เข้ามาใช้ในองค์กรและการเผยแพร่ความรู้ใหม่นั้นไปยังบุคคลอื่นหรือหน่วย งานอื่น**
2. **ปัยจัยที่มีผลกระทบกับพฤติกรรมเช่น รางวัล ความสนิทสนม ความไว้เนื้อเชื่อใจเป็นต้น**
3. **ปัจจัยด้านองค์กรและการจัดการ เช่น ผู้นำ การปรับองค์กร นโยบายต่างๆ**
4. **กระบวนการการนำความรู้ใหม่เข้าสู่องค์กรและการประยุกต์ใช้**

การเก็บข้อมูลจะเน้นที่การนำเอาความรู้ใหม่เข้ามาและประยุกต์ใช้ทั้งที่ประสพความสำเร็จหนึ่งกรณี และที่ไม่ประสพความสำเร็จอีกหนึ่งกรณี

ในการสัมภาษณ์จะเป็นภาษาไทยโดยจะเป็นการสอบถามถึงกรณีทั้งสองโดยมีมุมมองตามปัจจัยทั้งสี่ โดยการสัมภาษณ์จะใช้เวลาประมาณ 1 ชั่วโมงต่อท่าน ทั้งนี้ต้องรบกวนขอรายชื่อทีมงานที่เกี่ยวข้องด้วยอีก 4 ท่านโดยทั้ง 4 ควรจะมาจากหน่วยงานที่แตกต่างกันเช่น หน่วยงานวิศวกรรม หน่วยงานขาย หน่วยงานบุคคล เป็นต้น

ในการสัมภาษณ์ผมอยากจะขออนุญาตบันทึกการสนทนาด้วย ขณะเดียวกันผมอาจจะขอหลักฐานที่เกี่ยวข้อง (ถ้ามี) ด้วยนะครับ

การเก็บข้อมูลนี้มีวัตถุประสงค์เพื่อการศึกษาเท่านั้น ชื่อของบริษัทและบุคคลจะถือเป็นความลับและจะไม่แสดงต่อสาธารณะเป็นอันขาด

ด้วยความนับถือ

จุลเทพ เสนีวงศ์ ณ อยุธยา

Dear Khun Bundit,

Thank you for opening up your company to allow me to collect data for my Bangkok University's Ph.D. research study. This is to summarize the details that we had on the phone with Thai translation at the bottom of this message.

My research study is about the company's ability to absorb of new knowledge from external sources and see how it's transformed and make use of it throughout the organization. I will focus my study on 4 factors.

1. Human factor from the decision point to adopt new knowledge and their roles and responsibility to help get the knowledge across the organization.
2. Behavioral factor of how incentives or cultures have on the absorption of new knowledge into the company.
3. Managerial and Leadership factor of how leadership support and encourage the absorption, as well as the adjustment of organization structure and resources to support the new absorption.
4. Process and Procedure of how the flow of works impact the absorption of new knowledge

The discussion topic will be on 2 cases, a successful and a failure of absorption, during the past recent years.

I wish to conduct interviews around those 2 cases with the 4 factors, starting with you, and I hope you could refer me to other staffs of yours from various departments, e.g. engineering, sales, marketing, HR, procurement, etc., that involves with such adoption of new knowledge cases.

The interview will be around 1 hour for each person. I wish to also request for your permission to record our conversation session. The interview will be conducted in Thai. During the data collection session, I may ask for evidence that support the discussion.

The study is entirely for academic purpose only. I ensure that your business credential and your name will not be release to public.

Best Regards,

Chulatep Senivongse

----Thai Translation below----

เรียนคุณบัณฑิตครับ

ขอบคุณมากที่ให้โอกาศผมได้เข้าไปเก็บข้อมูลสำหรับการทำวิจัยระดับปริญญาเอกของมหาวิทยาลัยกรุงเทพ สำหรับรายละเอียดตามที่ได้คุยกันทางโทรศัพท์นั้นสรุปได้ดังนี้ครับ

งานวิจัยของผมเกี่ยวข้องกับความสามารถขององค์กรในการรับความรู้ใหม่ๆแล้วนำมาปรับใช้เพื่อเพิ่มขีดความสามารถในการแข่งขัน ในงานศึกษาของผมนั้นผมจะเน้นอยู่ที่องค์ประกอบสี่ตัวดังนี้

1. **ปัจจัย ทางด้านบุคคล ผมจะดูบทบาทของคนที่เกี่ยวข้องตั้งแต่เริ่มตัดสินใจที่จะเลือกเอาความรู้ ใหม่เข้ามาใช้ในองค์กรและการเผยแพร่ความรู้ใหม่นั้นไปยังบุคคลอื่นหรือหน่วย งานอื่น**
2. **ปัยจัยที่มีผลกระทบกับพฤติกรรมเช่น รางวัล ความสนิทสนม ความไว้เนื้อเชื่อใจ เป็นต้น**
3. **ปัจจัยด้านองค์กรและการจัดการ เช่น ผู้นำ การปรับองค์กร นโยบายต่างๆ**
4. **กระบวนการการนำความรู้ใหม่เข้าสู่องค์กรและการประยุกต์ใช้**

การเก็บข้อมูลจะเน้นที่การนำเอาความรู้ใหม่เข้ามาและประยุกต์ใช้ทั้งที่ประสพความสำเร็จหนึ่งกรณี และที่ไม่ประสพความสำเร็จอีกหนึ่งกรณี

ในการสัมภาษณ์จะเป็นภาษาไทยโดยจะเป็นการสอบถามถึงกรณีทั้งสองโดยมีมุมมองตามปัจจัยทั้งสี่ โดยการสัมภาษณ์จะใช้เวลาประมาณ 1 ชั่วโมงต่อท่าน ทั้งนี้ต้องรบกวนขอรายชื่อทีมงานที่เกี่ยวข้องด้วยอีก โดยทุกท่านควรจะมาจากหน่วยงานที่แตกต่างกัน เช่น หน่วยงานวิศวกรรม หน่วยงานขาย หน่วยงานการตลาด หน่วยงานจัดซื้อ หน่วยงานบุคคล เป็นต้น

ในการสัมภาษณ์ผมอยากจะขออนุญาตบันทึกการสนทนาด้วย ขณะเดียวกันผมอาจจะขอหลักฐานที่เกี่ยวข้อง (ถ้ามี) ด้วยนะครับ

การเก็บข้อมูลนี้มีวัตถุประสงค์เพื่อการศึกษาเท่านั้น ชื่อของบริษัทและบุคคลจะถือเป็นความลับและจะไม่แสดงต่อสาธารณะเป็นอันขาด

ด้วยความนับถือ

จุลเทพ เสนีวงศ์ ณ อยุธยา

Dear Khun Cherdsak,

Thank you for opening up your company to allow me to collect data for my Bangkok University's Ph.D. research study. This is to summarize the details that we had on the phone with Thai translation at the bottom of this message.

My research study is about the company's ability to absorb of new knowledge from external sources and see how it's transformed and make use of it throughout the organization. I will focus my study on 4 factors.

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4. Process and Procedure of how the flow of works impact the absorption of new knowledge

The discussion topic will be on 2 cases, a successful and a failure of absorption, during the past recent years.

I wish to conduct interviews around those 2 cases with the 4 factors, starting with you, and I hope you could refer me up to other 15 staffs of yours from various departments, e.g. engineering, sales, marketing, HR, procurement, etc., that involves with such adoption of new knowledge cases.

The interview will be around 1 hour for each person. I wish to also request for your permission to record our conversation session. The interview will be conducted in Thai. During the data collection session, I may ask for evidence that support the discussion.

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Best Regards,

Chulatep Senivongse

----Thai Translation below----

เรียนคุณเชิดศักดิ์ครับ

ขอบคุณมากที่ให้โอกาศผมได้เข้าไปเก็บข้อมูลสำหรับการทำวิจัยระดับปริญญาเอกของมหาวิทยาลัยกรุงเทพ สำหรับรายละเอียดตามที่ได้คุยกันทางโทรศัพท์นั้นสรุปได้ดังนี้ครับ

งานวิจัยของผมเกี่ยวข้องกับความสามารถขององค์กรในการรับความรู้ใหม่ๆแล้วนำมาปรับใช้เพื่อเพิ่มขีดความสามารถในการแข่งขัน ในงานศึกษาของผมนั้นผมจะเน้นอยู่ที่องค์ประกอบสี่ตัวดังนี้

1. **ปัจจัย ทางด้านบุคคล ผมจะดูบทบาทของคนที่เกี่ยวข้องตั้งแต่เริ่มตัดสินใจที่จะเลือกเอาความรู้ ใหม่เข้ามาใช้ในองค์กรและการเผยแพร่ความรู้ใหม่นั้นไปยังบุคคลอื่นหรือหน่วย งานอื่น**
2. **ปัยจัยที่มีผลกระทบกับพฤติกรรมเช่น รางวัล ความสนิทสนม ความไว้เนื้อเชื่อใจ เป็นต้น**
3. **ปัจจัยด้านองค์กรและการจัดการ เช่น ผู้นำ การปรับองค์กร นโยบายต่างๆ**
4. **กระบวนการการนำความรู้ใหม่เข้าสู่องค์กรและการประยุกต์ใช้**

การเก็บข้อมูลจะเน้นที่การนำเอาความรู้ใหม่เข้ามาและประยุกต์ใช้ทั้งที่ประสพความสำเร็จหนึ่งกรณี และที่ไม่ประสพความสำเร็จอีกหนึ่งกรณี

ในการสัมภาษณ์จะเป็นภาษาไทยโดยจะเป็นการสอบถามถึงกรณีทั้งสองโดยมีมุมมองตามปัจจัยทั้งสี่ โดยการสัมภาษณ์จะใช้เวลาประมาณ 1 ชั่วโมงต่อท่าน ทั้งนี้ต้องรบกวนขอรายชื่อทีมงานที่เกี่ยวข้องด้วยอีกประมาณ 15 ท่านโดยทั้ง 15 ท่านควรจะมาจากหน่วยงานที่แตกต่างกันเช่น หน่วยงานวิศวกรรม หน่วยงานขาย หน่วยงานการตลาด หน่วยงานจัดซื้อ หน่วยงานบุคคล เป็นต้น

ในการสัมภาษณ์ผมอยากจะขออนุญาตบันทึกการสนทนาด้วย ขณะเดียวกันผมอาจจะขอหลักฐานที่เกี่ยวข้อง (ถ้ามี) ด้วยนะครับ

การเก็บข้อมูลนี้มีวัตถุประสงค์เพื่อการศึกษาเท่านั้น ชื่อของบริษัทและบุคคลจะถือเป็นความลับและจะไม่แสดงต่อสาธารณะเป็นอันขาด

ด้วยความนับถือ

จุลเทพ เสนีวงศ์ ณ อยุธยา

Dear Khun Thanapat krub,

Thank you for opening up your company to allow me to collect data for my Bangkok University's Ph.D. research study. This is to summarize the details that we had with Thai translation at the bottom of this message.

My research study is about the company's ability to absorb of new knowledge from external sources and see how it's transformed and make use of it throughout the organization. I will focus my study on 4 factors.

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The discussion topic will be on 2 cases, a successful and a failure of absorption, during the past recent years.

I wish to conduct interviews around those 2 cases with the 4 factors, starting with you, and I hope you could refer me to other 10 – 15 staffs of yours from various departments, e.g. engineering, sales, HR, etc., that involves with such adoption of new knowledge cases.

The interview will be around 1 hour for each person. I wish to also request for your permission to record our conversation session. The interview will be conducted in Thai. During the data collection session, I may ask for evidence that support the discussion.

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Best Regards,

Chulatep Senivongse

----Thai Translation below----

เรียนคุณธนภัทรครับ

ขอบคุณมากที่ให้โอกาศผมได้เข้าไปเก็บข้อมูลสำหรับการทำวิจัยระดับปริญญาเอกของมหาวิทยาลัยกรุงเทพ สำหรับรายละเอียดตามที่ได้คุยกันสรุปได้ดังนี้ครับ

งานวิจัยของผมเกี่ยวข้องกับความสามารถขององค์กรในการรับความรู้ใหม่ๆแล้วนำมาปรับใช้เพื่อเพิ่มขีดความสามารถในการแข่งขัน ในงานศึกษาของผมนั้นผมจะเน้นอยู่ที่องค์ประกอบสี่ตัวดังนี้

1. **ปัจจัย ของบุคคล ผมจะดูบทบาทของคนที่เกี่ยวข้องตั้งแต่เริ่มตัดสินใจที่จะเลือกเอาความรู้ ใหม่เข้ามาใช้ในองค์กรและการเผยแพร่ความรู้ใหม่นั้นไปยังบุคคลอื่นหรือหน่วย งานอื่น**
2. **ปัยจัยที่มีผลกระทบกับพฤติกรรมเช่น รางวัล ความสนิทสนม ความไว้เนื้อเชื่อใจ เป็นต้น**
3. **ปัจจัยด้านองค์กรและการจัดการ เช่น ผู้นำ การปรับองค์กร นโยบายต่างๆ**
4. **กระบวนการการนำความรู้ใหม่เข้าสู่องกรณ์และการประยุกต์ใช้**

การเก็บข้อมูลจะเน้นที่การนำเอาความรู้ใหม่เข้ามาและประยุกต์ใช้ทั้งที่ประสพความสำเร็จหนึ่กรณี และที่ไม่ประสพความสำเร็จอีกหนึ่งกรณี

ในการสัมภาษณ์จะเป็นภาษาไทยโดยจะเป็นการสอบถามถึงกรณีทั้งสองโดยมีมุมมองตามปัจจัยทั้งสี่ โดยการสัมภาษณ์จะใช้เวลาประมาณ 1 ชั่วโมงต่อท่าน ทั้งนี้ต้องรบกวนขอรายชื่อทีมงานที่เกี่ยวข้องด้วยอีกประมาณ 10 – 15 ท่าน โดยทั้งหมดควรจะมาจากหน่วยงานที่แตกต่างกันเช่น หน่วยงานวิศวกรรม หน่วยงานขาย หน่วยงานบุคคล เป็นต้น

ในการสัมภาษณ์ผมอยากจะขออนุญาตบันทึกการสนทนาด้วย ขณะเดียวกันผมอาจจะขอหลักฐานที่เกี่ยวข้อง (ถ้ามี) ด้วยนะครับ

การเก็บข้อมูลนี้มีวัตถุประสงค์เพื่อการศึกษาเท่านั้น ชื่อของบริษัทและบุคคลจะถือเป็นความลับและจะไม่แสดงต่อสาธารณะเป็นอันขาด

ด้วยความนับถือ

จุลเทพ เสนีวงศ์ ณ อยุธยา

APPENDIX 4: Financial Performance from the Department of Business Development of Thailand

From the retrieved financial information of the companies in the case study, item 6, 7, and 9 are used as the impacted financial performances. Item 6 is the Total Asset Turnover, item 7 is the Total Account Receivable Turnover, and item 9 is the Gross Profit Margin. The information is available for 3 years from 2013-2015.

อัตราส่วนทางการเงิน บริษัท เอเอสดี ดิสทริบิวชั่น จำกัด

ข้อมูล ณ ปี

ลำดับ	อัตราส่วน	2556	2557	2558
อัตราส่วนแสดงความสามารถในการทำกำไร				
1	อัตราผลตอบแทนจากสินทรัพย์รวม(ROA)(%)	0.85	0.88	9.29
2	อัตราผลตอบแทนจากส่วนของผู้ถือหุ้น(ROE)(%)	5.11	4.76	34.79
3	ผลตอบแทนจากกำไรขั้นต้นต่อรายได้รวม(%)			
4	ผลตอบแทนจากการดำเนินงานต่อรายได้รวม(%)	0.99	1.12	5.36
5	ผลตอบแทนจากกำไรสุทธิต่อรายได้รวม(%)	0.69	0.60	4.07
อัตราส่วนแสดงประสิทธิภาพในการดำเนินงาน				
6	อัตราหมุนเวียนของสินทรัพย์รวม(เท่า)	1.23	1.47	2.28
7	อัตราหมุนเวียนของลูกหนี้(เท่า)	9.21	9.01	5.92
8	อัตราหมุนเวียนของสินค้าคงเหลือ(เท่า)	1.53	2.34	6.04
9	อัตราค่าใช้จ่ายดำเนินงานต่อรายได้รวม (%)	31.44	23.37	22.55
ตัวชี้วัดสภาพคล่อง				
10	อัตราส่วนทุนหมุนเวียน(เท่า)	1.48	5.16	4.15
อัตราส่วนโครงสร้างงบแสดงฐานะการเงิน				
11	อัตราส่วนหนี้สินรวมต่อสินทรัพย์รวม(เท่า)	0.83	0.80	0.65
12	อัตราส่วนสินทรัพย์รวมต่อส่วนของผู้ถือหุ้น(เท่า)	5.89	4.97	2.89
13	อัตราส่วนหนี้สินรวมต่อส่วนของผู้ถือหุ้น(เท่า)	4.89	3.97	1.89

อัตราส่วนทางการเงิน บริษัท บลูซีบรา จำกัด
ข้อมูล ณ ปี

ลำดับ	อัตราส่วน	2556	2557	2558
อัตราส่วนแสดงความสามารถในการทำกำไร				
1	อัตราผลตอบแทนจากสินทรัพย์รวม(ROA)(%)	10.13	4.60	0.53
2	อัตราผลตอบแทนจากส่วนของผู้ถือหุ้น(ROE)(%)	31.95	17.06	2.29
3	ผลตอบแทนจากกำไรขั้นต้นต่อรายได้รวม(%)			
4	ผลตอบแทนจากการดำเนินงานต่อรายได้รวม(%)	8.50	6.13	3.10
5	ผลตอบแทนจากกำไรสุทธิต่อรายได้รวม(%)	6.52	4.71	1.84
อัตราส่วนแสดงประสิทธิภาพในการดำเนินงาน				
6	อัตราหมุนเวียนของสินทรัพย์รวม(เท่า)	1.55	0.98	0.29
7	อัตราหมุนเวียนของลูกหนี้(เท่า)	4.19	4.40	1.57
8	อัตราหมุนเวียนของสินค้าคงเหลือ(เท่า)	0.00	0.00	0.00
9	อัตราค่าใช้จ่ายดำเนินงานต่อรายได้รวม (%)	22.16	23.86	33.34
ตัวชี้วัดสภาพคล่อง				
10	อัตราส่วนทุนหมุนเวียน(เท่า)	1.14	0.97	1.01
อัตราส่วนโครงสร้างงบแสดงฐานะการเงิน				
11	อัตราส่วนหนี้สินรวมต่อสินทรัพย์รวม(เท่า)	0.68	0.77	0.76
12	อัตราส่วนสินทรัพย์รวมต่อส่วนของผู้ถือหุ้น(เท่า)	3.12	4.42	4.25
13	อัตราส่วนหนี้สินรวมต่อส่วนของผู้ถือหุ้น(เท่า)	2.12	3.42	3.25

อัตราส่วนทางการเงิน บริษัท คอมเนท จำกัด

ข้อมูล ณ ปี

ลำดับ	อัตราส่วน	2556	2557	2558
อัตราส่วนแสดงความสามารถในการทำกำไร				
1	อัตราผลตอบแทนจากสินทรัพย์รวม(ROA)(%)	7.59	11.13	18.40
2	อัตราผลตอบแทนจากส่วนของผู้ถือหุ้น(ROE)(%)	13.32	17.47	25.75
3	ผลตอบแทนจากกำไรขั้นต้นต่อรายได้รวม(%)			
4	ผลตอบแทนจากการดำเนินงานต่อรายได้รวม(%)	6.41	8.07	10.29
5	ผลตอบแทนจากกำไรสุทธิต่อรายได้รวม(%)	4.87	6.23	8.04
อัตราส่วนแสดงประสิทธิภาพในการดำเนินงาน				
6	อัตราหมุนเวียนของสินทรัพย์รวม(เท่า)	1.56	1.79	2.29
7	อัตราหมุนเวียนของลูกหนี้(เท่า)	6.37	5.50	6.90
8	อัตราหมุนเวียนของสินค้าคงเหลือ(เท่า)	26.53	67.36	122.90
9	อัตราค่าใช้จ่ายดำเนินงานต่อรายได้รวม (%)	22.75	21.94	16.90
ตัวชี้วัดสภาพคล่อง				
10	อัตราส่วนทุนหมุนเวียน(เท่า)	1.94	1.94	2.84
อัตราส่วนโครงสร้างงบแสดงฐานะการเงิน				
11	อัตราส่วนหนี้สินรวมต่อสินทรัพย์รวม(เท่า)	0.37	0.36	0.22
12	อัตราส่วนสินทรัพย์รวมต่อส่วนของผู้ถือหุ้น(เท่า)	1.59	1.55	1.29
13	อัตราส่วนหนี้สินรวมต่อส่วนของผู้ถือหุ้น(เท่า)	0.59	0.55	0.29

อัตราส่วนทางการเงิน บริษัท ดีเซอร์วิสแอนด์คอนซัลติ้ง จำกัด
ข้อมูล ณ ปี

ลำดับ	อัตราส่วน	2556	2557	2558
อัตราส่วนแสดงความสามารถในการทำกำไร				
1	อัตราผลตอบแทนจากสินทรัพย์รวม(ROA)(%)	27.70	17.84	15.62
2	อัตราผลตอบแทนจากส่วนของผู้ถือหุ้น(ROE)(%)	45.08	27.70	21.51
3	ผลตอบแทนจากกำไรขั้นต้นต่อรายได้รวม(%)			
4	ผลตอบแทนจากการดำเนินงานต่อรายได้รวม(%)	12.60	8.06	10.51
5	ผลตอบแทนจากกำไรสุทธิต่อรายได้รวม(%)	10.74	6.86	9.41
อัตราส่วนแสดงประสิทธิภาพในการดำเนินงาน				
6	อัตราหมุนเวียนของสินทรัพย์รวม(เท่า)	2.58	2.60	1.66
7	อัตราหมุนเวียนของลูกหนี้(เท่า)	5.07	4.73	4.91
8	อัตราหมุนเวียนของสินค้าคงเหลือ(เท่า)	0.00	0.00	0.00
9	อัตราค่าใช้จ่ายดำเนินงานต่อรายได้รวม (%)	8.27	9.78	14.27
ตัวชี้วัดสภาพคล่อง				
10	อัตราส่วนทุนหมุนเวียน(เท่า)	2.88	2.88	3.65
อัตราส่วนโครงสร้างงบแสดงฐานะการเงิน				
11	อัตราส่วนหนี้สินรวมต่อสินทรัพย์รวม(เท่า)	0.37	0.35	0.20
12	อัตราส่วนสินทรัพย์รวมต่อส่วนของผู้ถือหุ้น(เท่า)	1.58	1.53	1.25
13	อัตราส่วนหนี้สินรวมต่อส่วนของผู้ถือหุ้น(เท่า)	0.58	0.53	0.25

อัตราส่วนทางการเงิน บริษัท มัลติมีเดีย เทคโนโลยี่ จำกัด
ข้อมูล ณ ปี

ลำดับ	อัตราส่วน	2556	2557	2558
อัตราส่วนแสดงความสามารถในการทำกำไร				
1	อัตราผลตอบแทนจากสินทรัพย์รวม(ROA)(%)	(-0.11)	(-19.10)	(-21.63)
2	อัตราผลตอบแทนจากส่วนของผู้ถือหุ้น(ROE)(%)	(-0.46)	(-113.31)	757.86
3	ผลตอบแทนจากกำไรขั้นต้นต่อรายได้รวม(%)			
4	ผลตอบแทนจากการดำเนินงานต่อรายได้รวม(%)	0.28	(-10.87)	(-8.42)
5	ผลตอบแทนจากกำไรสุทธิต่อรายได้รวม(%)	(-0.05)	(-10.87)	(-8.42)
อัตราส่วนแสดงประสิทธิภาพในการดำเนินงาน				
6	อัตราหมุนเวียนของสินทรัพย์รวม(เท่า)	2.15	1.76	2.57
7	อัตราหมุนเวียนของลูกหนี้(เท่า)	12.58	6.06	10.76
8	อัตราหมุนเวียนของสินค้าคงเหลือ(เท่า)	5.80	11.21	21.19
9	อัตราค่าใช้จ่ายดำเนินงานต่อรายได้รวม (%)	38.34	49.82	37.59
ตัวชี้วัดสภาพคล่อง				
10	อัตราส่วนทุนหมุนเวียน(เท่า)	1.21	0.90	0.51
อัตราส่วนโครงสร้างงบแสดงฐานะการเงิน				
11	อัตราส่วนหนี้สินรวมต่อสินทรัพย์รวม(เท่า)	0.73	0.93	1.15
12	อัตราส่วนสินทรัพย์รวมต่อส่วนของผู้ถือหุ้น(เท่า)	3.69	14.02	(-6.46)
13	อัตราส่วนหนี้สินรวมต่อส่วนของผู้ถือหุ้น(เท่า)	2.69	13.02	(-7.46)

อัตราส่วนทางการเงิน บริษัท ทรูคอนเน็คท์ จำกัด
ข้อมูล ณ ปี

ลำดับ	อัตราส่วน	2556	2557	2558
อัตราส่วนแสดงความสามารถในการทำกำไร				
1	อัตราผลตอบแทนจากสินทรัพย์รวม(ROA)(%)	0.12	0.10	0.24
2	อัตราผลตอบแทนจากส่วนของผู้ถือหุ้น(ROE)(%)	1.11	0.81	1.80
3	ผลตอบแทนจากกำไรขั้นต้นต่อรายได้รวม(%)			
4	ผลตอบแทนจากการดำเนินงานต่อรายได้รวม(%)	0.86	0.83	0.73
5	ผลตอบแทนจากกำไรสุทธิต่อรายได้รวม(%)	0.23	0.15	0.29
อัตราส่วนแสดงประสิทธิภาพในการดำเนินงาน				
6	อัตราหมุนเวียนของสินทรัพย์รวม(เท่า)	0.53	0.62	0.83
7	อัตราหมุนเวียนของลูกหนี้(เท่า)	2.00	4.82	6.64
8	อัตราหมุนเวียนของสินค้าคงเหลือ(เท่า)	3.96	4.33	5.48
9	อัตราค่าใช้จ่ายดำเนินงานต่อรายได้รวม (%)	30.60	30.77	24.93
ตัวชี้วัดสภาพคล่อง				
10	อัตราส่วนทุนหมุนเวียน(เท่า)	0.92	0.94	0.88
อัตราส่วนโครงสร้างงบแสดงฐานะการเงิน				
11	อัตราส่วนหนี้สินรวมต่อสินทรัพย์รวม(เท่า)	0.86	0.89	0.81
12	อัตราส่วนสินทรัพย์รวมต่อส่วนของผู้ถือหุ้น(เท่า)	7.39	9.42	5.40
13	อัตราส่วนหนี้สินรวมต่อส่วนของผู้ถือหุ้น(เท่า)	6.39	8.42	4.40

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